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THE UNIVERSITY OF ALBERTA

VISITOR ATTITUDES, PERCEPTIONS, AND KNOWLEDGE CONCERNING BEARS AND BEAR MANAGEMENT PRACTICES, WATERTON LAKES NATIONAL PARK, CANADA

by

Roland R. Maw

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY
IN
WILDLAND RECREATION
DEPARTMENT OF FOREST SCIENCE

EDMONTON, ALBERTA
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled VISITOR ATTITUDES, PERCEPTIONS, AND KNOWLEDGE CONCERNING BEARS AND BEAR MANAGEMENT PRACTICES, WATERTON LAKES NATIONAL PARK, CANADA submitted by Roland R. Maw in partial fulfilment of the requirements for the degree of DOCTOR OF PHILOSOPHY.

James R. Butler

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Date April 26, 1989

ABSTRACT

Interviews with 370 visitors selected at random in Waterton Lakes National Park, Canada, were focussed specially on visitor attitudes, values, and management preferences concerning grizzly and black bears. These data will allow improvement of management and preservation of park bear populations and higher levels of visitor safety. Nearly 80 percent of the visitors interviewed considered "bears" or grizzly bears as dangerous animals; no one specifically identified black bears as dangerous even though encounters with black bears account for nearly half the attacks on visitors. Of the visitors that considered bears dangerous, over 54 percent failed to take precautions regarding possible encounters with bears. The variables examined in the study that were believed to most influence whether or not an individual would take precautionary measures against bears include a) the visitor's source of information about bears, b) age, c) education level, d) location at time of interview and e) the type of user.

This study revealed that the park visitors interviewed have a positive attitude toward bears and do not want park staff to engage in any management action that would result in the killing of bears. Even when these visitors considered bears dangerous, that did not mean they disliked bears. The value that the visitor held for bears was found to be related to the visitor's a) level of biological bear knowledge, b) age, c) educational level, d) population size of current home area and e) type of user. There was a relationship between higher levels of biological bear knowledge and ecological, aesthetic, and naturalistic values for bear, while the lower levels of biological bear knowledge were related to utilitarian and negativistic values.

Of the visitors surveyed, level of knowledge concerning the biology of bears was found to be only moderate and revealed a general lack of ability to distinguish between the two species. A majority of the visitors, 60 percent, which includes hikers and trail users, thought that size and color were the two best distinguishing characteristics between the two species. In truth these characteristics are highly unreliable. The level of the visitor's biological knowledge about bears was strongly related to sources of bear information. The "Bears and Man" film and park staff were found to be the most effective sources of information about bears as measured by the numbers of people taking precautions, able to distinguish between the two bear species, or having a high level of knowledge about bear biology.

In response to questions concerning hypothetical bear encounter situations, nearly 20 percent of the visitors suggested "dangerous" responses. While conventional attitude theory suggests that there should be a relationship between attitudes, knowledge, and the actual behaviour of park visitors, these relationships appeared to be present in some situations and absent in others. Opportunities for further research are also proposed concerning visitor-bear interactions.

This study does suggest that in the future, bear management programs should include provision for information on appropriate precautionary measures, the value of bears, and their role in the environment. Also, any management program based on bear census or distribution data collected from the visitors must be designed very carefully to avoid unreliable species identifications.

In contrast to perceived opinions among park staff, there was strong visitor support for bears to receive management priority for the use of a valley in the park. Many visitors indicated a willingness to give up their use of a valley in order to preserve bear populations.

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1. BACKGROUND TO THE STUDY

The principal management reaction to most bear-human interactions has usually been focussed on the bears. Few in-depth studies have been done on the human aspect of visitor-bear interactions. As any two species come into contact or compete directly for a resource, there are often adjustments made by both species. Rather than focus on the problems for bears which result from visitor use, this study was undertaken to determine visitor attitudes, knowledge, and perceptions about bears and to look at the implications of this information for current bear management practices. The more information on what people believe, how they perceive bears, and what facts influence belief structures concerning bears, the better park managers will be able to meet the objectives stated in existing management policies. In order to facilitate and reach my objectives, it seemed necessary to quantify and qualify visitor knowledge, attitudes, and socio-demographic characteristics. Direct observational data on the interactions between bears and visitors are scattered and difficult to obtain in a systematic manner. However, interviews about visitor's knowledge of bear biology, past experiences with animals, the effectiveness of interpretive programs, and stated responses to hypothetical bear encounters allowed for the collection of data that provided both pertinent and relevant contributions to our understanding of and predicting of park visitor attitudes and human behaviours associated with bears.

When humans and bears (both black bears, *Ursus americanus*, and grizzly bears, *Ursus arctos*, including all subspecies of both species) occupy the same habitats, negative encounters occurred. Such conflicts are the result of a wide variety of factors including surprise encounters, feeding of bears by the visitor, foraging on visitor's garbage by the bears and, in recent cases, predatory-like attacks on humans. It is interesting to note that there is very little difference in total number of events (Table 1) between the two bear species when considering human deaths and non-fatal injuries caused by bears.

Table 1 includes only those fatal and non-fatal attacks on humans by bears in North America from 1900 to 1985 and for the areas of concurrent distribution of both species. Therefore, the attacks on humans by black bear from eastern North America and areas where

Table 1. Fatal and Non-fatal Attacks on Humans by Bears From 1900–May 1985

	Grizzly	Black	Unknown	Total
Fatal Attacks in Parks	16	3	0	19
Non-fatal Attacks in Parks	63	68	34	165
Fatal Attacks outside Parks	6	12	5	23
Non-fatal Attacks outside Parks	42	33	7	82
Fatal Attacks Total	22	15	5	42
Non-fatal Attacks Total	105	101	41	247
Total Fatal and Non-fatal Attacks	127	116	46	289

Adapted from: Parks Canada (1985), Cramond (1981) grizzlies are no longer present are not included. Generally, black bear population densities are higher than those for grizzlies, except for some areas in Alaska. These higher densities of black bear may explain the almost equal numbers of fatal and non-fatal attacks caused by black bears.

Although there is a significant and real danger of visitor-bear encounters, it is estimated that in Glacier National Park (which is adjacent to Waterton Lakes National Park) the 10 year, bear-caused visitor injury-death rate is 2.1 per year or 1.41 injuries-deaths per million visitors (U.S.D.I. 1984).

Although this study was centred in Waterton Lakes National Park, Canada, it is difficult to totally separate what is happening in the adjoining Glacier National Park, U.S.A., because of the intermingling populations of both visitors and bears. In Waterton Lakes National Park there has been only one visitor fatality resulting from a bear (a seven-year-old girl in 1977) and at least another 10 visitor injuries which resulted from bear activities. During the same time in Glacier National Park, there have been six visitor fatalities related to bears and at least 41 visitor injuries.

As the land to the east and north of Waterton Lakes National Park has been developed, the bear populations have been primarily confined to the park and the immediate land areas. Also, like so many other national parks, Waterton Lakes National Park has had a significant increase in visitations from 346,081 in 1974 to over 650,000 visitors in 1985. Most of this visitor use of the park was during the time when bears were out of the den, actively searching for food, raising cubs, and moving about. Increased human use of the park exerts an increasing pressure on the bear populations for space and solitude (U.S.D.I. 1986). Therefore, to reduce the number of encounters, injuries, and deaths of both visitors and bears, two primary management actions have been implemented. First, the historical approach was to remove the "problem bear" from the population either by death or long distance relocation. This practice encouraged shyness in bears as a response to the presence of humans. This increased shyness may not be a completely natural behaviour, but an artifact of selective pressure against undesirable traits over the past century (U.S.D.I. 1984). The removal of "problem bears" takes on new meaning when considering the policy of the Canadian national parks, that natural resources within the national parks be protected to ensure the perpetuation of a natural environment essentially unaltered by visitor activity (Parks Canada 1980). Bears are one important component of these natural systems. Another management option has been to manage the visitor component. "To protect the resources within the national parks or to ensure visitor safety and enjoyment, the amount, kind, time, and location of activities of the park visitors may need to be regulated" (Parks Canada 1980). In the bear management plans for Waterton Lakes National Park and Glacier National Parks, there are provisions whereby the superintendent can close areas or zones when there is a danger related to bears. Bear behaviours classified as defensive are considered natural, with management responses directed toward visitor-use control. Bear behaviour classified as aggressive is considered undesirable, with management responses directed toward the bear. The expression of either bear behaviour will be minimized through park-wide visitor-use management. In both Waterton Lakes National Park and Glacier National Park, there are provisions to restrict the visitor use of an area when considering maintenance of natural populations of bears and visitor's safety.

2. BEAR/HUMAN COEXISTENCE IN NORTH AMERICA

2.1 The Historical Perspective

The grizzly and black bears of North America have been known to the Europeans for over four hundred years. Cebeza de Vaca, an early Spanish explorer, and three of his companions were probably the first Europeans to challenge the domain of the black and grizzly bears. These four men spent nine years, from 1527 to 1536, wandering through Texas and northern Mexico (Schneider 1977). Although no known written records by this party specifically mention the black or grizzly bears, this area was known in later times to contain large populations of both species (Figures 1 and 2). A few years later in 1540, Francesco Vasquez de Coronado was the first European to record an encounter with the grizzly bear in what is now west-central New Mexico (Craighead 1979). These discoveries and encounters with what we now call grizzlies occurred within a half-century of the first Europeans landing in the New World.

It is not known for certain when Europeans first encountered black bear in North America. However, these must have occurred at about the same time as, or just prior to, the grizzly's discovery, since black bears historically inhabited the whole region surrounding the Caribbean (Hall and Kelson 1981) (Figure 2).

In 1602, another explorer, Sebastian Viscaino, described grizzlies feeding on a whale carcass near what is now Monterey, California (Craighead 1979).

The first written record in Canada of a bear thought to be a grizzly occurred in 1666 by Claude Jean Allouez, a French explorer on the Assiniboine River, just west of present-day Winnipeg. In a journal entry, he recounts a situation concerning Indians who lived on fish and "who are in turn eaten by bears of frightful size, all red, and with prodigiously long claws" (Schneider 1977, p. 13).

Perhaps the first reference in Canada to the killing of a grizzly by a European was in 1690. It appears as a journal entry dated August 18, 1690, by Henry Kelsey who, at the time, was exploring the northern Canadian Plains for the Hudson's Bay Company.

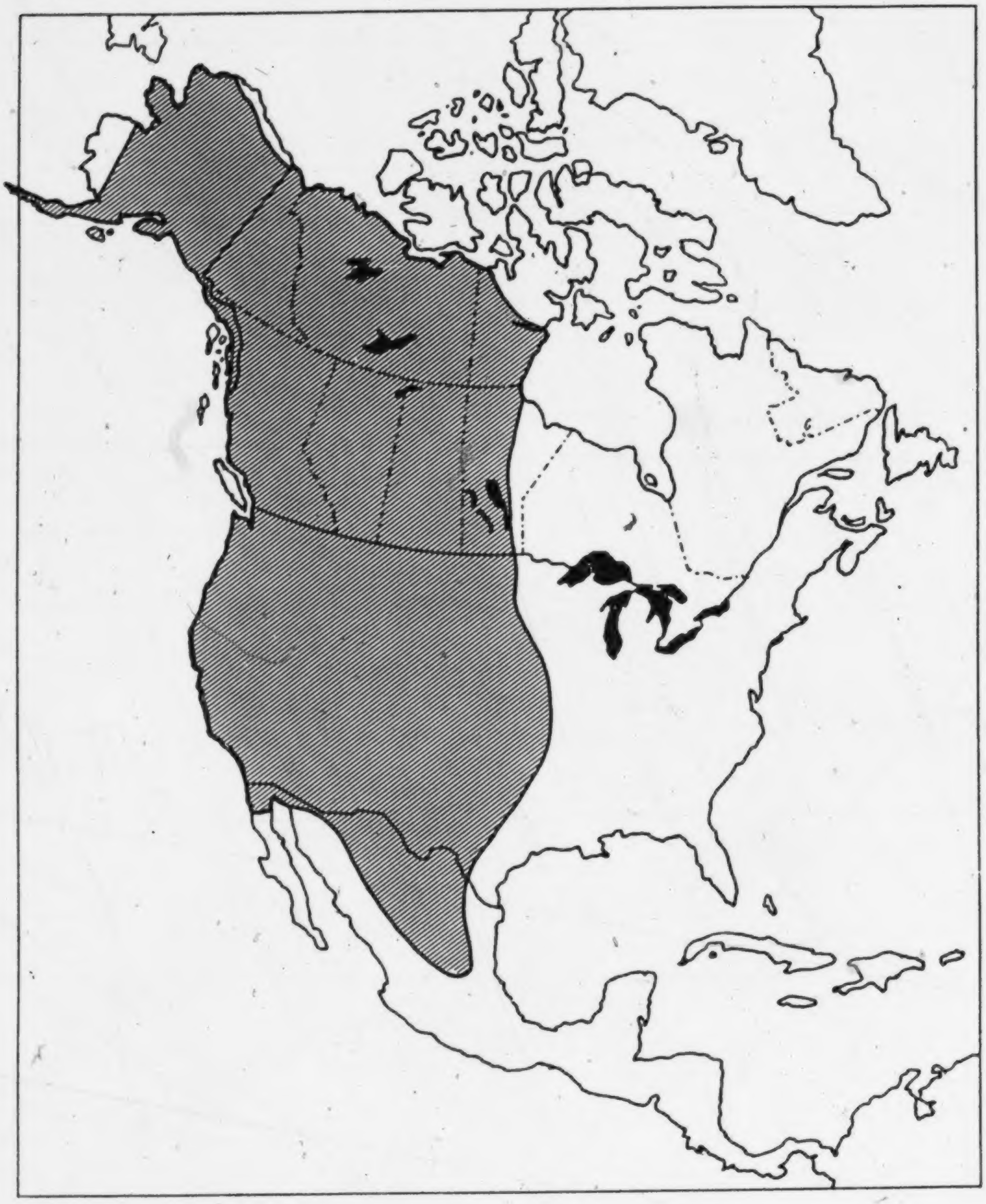

Figure 1

Original Grizzly Bear distribution in North America (adapted from Hall & Kelson 1981).

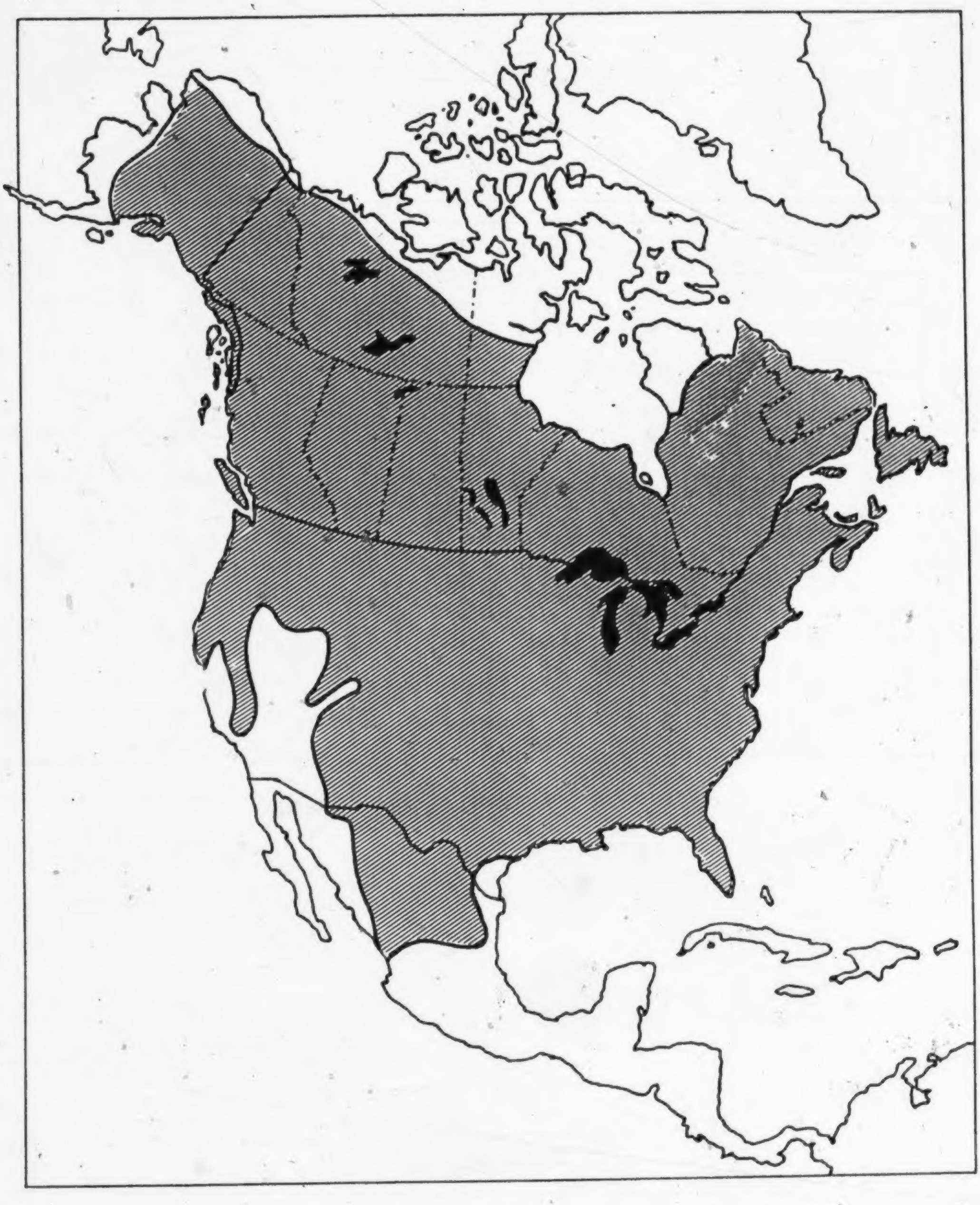

Figure 2

Original Black Bear Distribution in North America (adapted from Hall and Kelson 1981).

> So far I have spoken concerning of the Spoil
> And now will give acco(unt) of the same country soile...
> And then you have the beasts of several kind
> The one is a black Buffillo great
> Another is an outgrown Bear w(hich) is good meat
> His skin to gett I have used all y(e) means I can
> He is mans food and he makes food of man
> His hide they would not me it preserve
>
> Henry Kelsey

Again on August 20, 1690, he wrote:

> Today we pitcht to y(e) outter most Edge of y(e) woods this plain affords Nothing but short Round sticky grass and Buffillo and a great sor(t) of a Bear w(hich) is Bigger than any white Bears and is neither white nor Black But silver hair'd like our English Rabbit y(e) Buffillo Likewise is not like those to y(e) Northward their Horns growing like and English ox but Black and short...
>
> Henry Kelsey

At the time of these two journal entries, the party's position was some 404 miles from Deering's Point (Deering's Point will probably never be positively determined), "but the length of Kelsey's voyage up the Saskatchewan River corresponds closely with the distance from Cedar Lake to the Carrot River. Kelsey's objective was to journey to the country of the Assiniboines, his destination, with its buffalo, grizzly bears and abundance of beavers" (Bell in Haynes and Haynes 1979, p. 3). These records refer to areas in Manitoba. As to the sighting of the first black bear in Canada, the record is uncertain, although Kelsey's August 20, 1690, entry makes a reference to the black bear when trying to describe the silver-haired bear.

The noted Canadian explorer, David Thompson, also recorded for history his experiences with the bears. His travels, beginning in 1784 at Fort Churchill on the Hudson's Bay, eventually covered the upper Missouri area then west across the Rocky Mountains to the Columbia River basin. His travels included much of Alberta, lower British Columbia, Washington, Oregon and Idaho. David Thompson explained how the natives he encountered viewed the bear.

> "The only bears of this country are the small black bears, with a chance yellow bear, this latter has fine fur and trades for three beaver in barter when full grown. The black bear is common and according to size passes for one or two beaver, the young are often tamed by the natives and are harmless and playful until near full grown, when they

> become troublesome and are killed or sent into the woods. The meat of the bear feeding on roots and berries becomes very fat and good, but after the very first meal of fish the taste of the meat is changed for the worse. Often the natives go in and kill the bear in its den after an appropriate ceremony. Of the animal, they (the natives) have several superstitions and he acts as a prominent part in many of their tales. The black, brown, and yellow bear feed on berries, nuts and anything else they can catch". (Glover in Haynes and Haynes 1979, p. 14).

Thompson even recounted a case where a bear had caught and killed an antelope upon which it was feeding. Additionally, in the Fort Augustus region, which was situated on the North Saskatchewan River near the confluence of the Sturgeon River, Manitoba, there were numerous herds of bison, several kinds of deer, and many bears of several colors. Evidently the Iroquois, who were recent arrivals to the area, were unfamiliar with the coloured bear as they paid little attention to the warnings of the others concerning how to deal with the wildlife of the region.

> "As two of them (Iroquois) were hunting they met a coloured bear, which one of them wounded. The bear sprung on him, and standing on his hind feet siezed the Iroquois hugging him with his forelegs and paws, which broke the bones of both arms above the elbow and with its teeth tore the skin off the head from the crown to the forehead; fortunately his comrade was near, and putting his gun closer to the bear shot him dead." (Glover in Haynes and Haynes 1979, p. 16).

It is assumed that this yellow or coloured bear was a grizzly. This is due to the increased value placed on the hide and the total unfamiliarity of the Iroquois in dealing with the coloured or yellow bear. There is no record of these natives having trouble hunting or trapping the black bear.

The most famous encounters with the grizzly came with the Lewis and Clark transcontinental expedition of 1804 to 1806. During this expedition the first grizzly bear was encountered on October 20, 1804, while on the banks of the upper Missouri River near the mouth of the Heart River in what is now North Dakota (Schneider 1977). A few months later, on May 5, 1805, near old Fort Charles at the mouth of Little Dry or Lackwater Creek in what is now Montana, a rather large grizzly bear was shot and killed. From this specimen the expedition took the first formal scientific measurements. These measurements were borrowed from the account of the Lewis and Clark expedition by George Ord in 1815 as the basis for the description and scientific name he gave to the species, *Ursus horribilis* (Storer and Trevis Jr. 1978; Craighead 1979). The mouth of Little Dry or Lackwater Creek in eastern Montana is the typed locality for the grizzly bear. The members of the Lewis and Clark expedition killed a total of 43 grizzlies. Even "today students of the Lewis and Clark expedition ask why were so many grizzlies killed? For what purpose? There is little evidence to suggest that they were used for food or rendered for oil. It also remains extremely doubtful that the bears were killed because of actual showdowns or confrontations. One has to question whether Lewis was really sincere in his statement, 'although game is very abundant and gentle, we only kill as much as is necessary for food' " (Schneider 1977, p. 15).

The original distribution for grizzlies was very extensive in Canada and the United States and covered all of North America except for the area east of a line extending from the west shore of Hudson's Bay south through central Texas down into central Mexico level with the southern tip of the Baja Penninsula (Figure 1). The original black bear distribution was even more extensive than the grizzly (Figure 2). The black bear's distribution was almost complete in Canada and the United States except for the high Arctic, extreme western and northern Alaska, and the deserts of the southwest (Figure 2).

From 1800 to the present, there occurred dramatic shifts in grizzly populations and distribution. In the 1800's, the distribution of the grizzly was near maximum for modern times. At that time, there were 17 states in the United States, 3 provinces and 2 territories in Canada, and 5 states in Mexico that had grizzly bear populations (Figure 3). However, it was during the next century the destruction and demise of the grizzly occurred. The 'horrible bear of the west' was killed by trappers, explorers, stockmen, homesteaders, and miners as they came west and moved in, displacing the grizzly. In many mountain ranges and valleys the bears were killed; state after state saw the last specimen of its most magnificent animal nailed to a barn wall (Schneider 1977). Some states recorded their last grizzly while others failed to even note the event. Even in Alberta the almost wholesale slaughter of grizzlies occurred. In the Cypress Hills, just 200 km east of Waterton Lakes National Park, over 750 grizzly bear pelts were traded in 1878 (Rikhoff in East 1977). This was not out of character with what was happening in other areas across the prairies and western North America during the rush to conquer and settle the west.

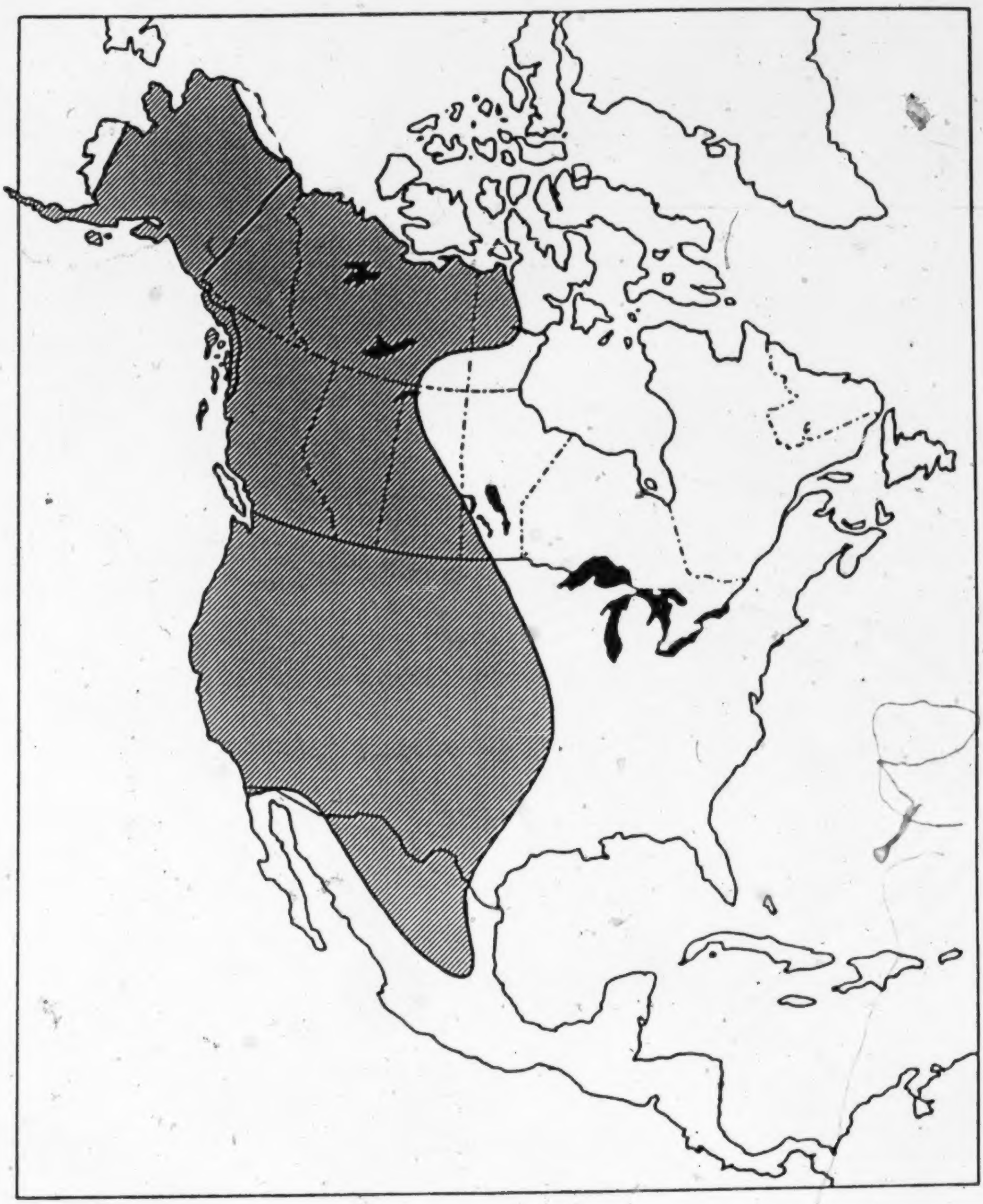

Figure 3

Grizzly Bear Distribution - 1800 adapted from (Schneider 1977)

One hundred and twenty years ago, Captain John Palliser gave an account of his adventures while exploring the country that lies between the head of the Great Lakes and the valley of the Columbia and Kootenay Rivers, giving several references to bears. In September 1857, while the expedition was travelling up the South Saskatchewan River, a large grizzly bear was observed that had come out of a clump of willows and lay sunning itself. The grizzly was calm, but the men were not (Spry 1963). This sighting was downstream from where the Red Deer River joins the South Saskatchewan River. The next day they saw the grizzly again, and several men went after it, but the bear vanished into thick willow growth. Later, at this same location, Palliser went on to tell how the group startled two grizzly bears and fired at one of them without success. The bears made for the plain and were followed on horseback. After a difficult chase, a female grizzly was shot and killed as she attempted to stand and fight (Spry 1963). The other bear, the larger of the two, got away.

In August, 1858, the Palliser expedition location was west of present day Calgary, in the area of Kananaskis Pass. This area was thought to be grizzly bear country. They passed several 'bears' dens, and one bear had taken up lodgings within twenty feet of their camp fire. Standing on their hind legs, the bears would strip the bark off the trees to a height of nine or ten feet, to get at the cambium layer and fluids. Unlike the black bears, they were never known to climb trees (Spry 1963). This reference must be about grizzlies; however, it is also a very common feeding behaviour of black bears to strip away the outer bark to expose the soft growing cambium layer. In some stands along the coast of Washington, fully 25 percent of the Douglas-fir trees have been damaged due to black bear feedings (Poelker and Hartwell 1973). It is this feeding behaviour by both black and grizzly bears that leads some naturalists to postulate that these scratched and claimed (marked) trees constituted some method of communications (Seton 1909). Both black and grizzly bear "measuring trees" or "marking trees" were observed by and classified by naturalists across the ranges of both species (Poelker and Hartwell 1973).

In the fall of 1958, Lt. Blakiston attempted to recross the mountains by another unexplored route. As Blakiston travelled up the Flathead Valley preparing to cross back into

British Territory, he used Boundary Pass, which is now called South Kootenay Pass. Once over the pass, travelling downhill he and his companions reached a series of lakes which Blakiston named Waterton Lakes, after the famous British naturalist Charles Waterton. The party camped near the lakes for two days and found the area to be abundant with animals including grizzly bears, trout, and northern pike (Spry 1963). This was the first recorded sighting of grizzlies in what is now Waterton Lakes National Park.

In California, the bear-bull fights were typical of the feelings toward the grizzly. Major Horace Bell described one of these early California bear-bull battles in the early 1800's (Bartlet in Schneider 1977). Typically a grizzly would be tethered to a post in the center of a ring, while an enraged wild bull would be turned loose to do battle with the bear. These contests continued up through the 1855-1865 era until the California grizzly population was severely depleted (Schneider 1977).

2.1.1 Population Status

Although there were significant reductions in grizzly population and distribution by 1900, there were still extensive populations in western North America (Figure 4). Then, very quickly after the turn of the century, one state after another announced, as New Mexico did in 1927, that its population of grizzlies had reached the point of almost or total extermination.

Aldo Leopold wrote about one of Arizona's last grizzlies, "Old Bigfoot", that had been pursued for years by a government trapper without success. Finally, the trapper set up a set-gun trap, and, as Leopold put it, "the last grizzly walked into a string and shot himself" (Leopold in Schneider 1977, p. 31).

By 1985 there had occurred almost a total loss of the grizzly in the lower 48 states except for the main trunk of the Rocky Mountains (Figure 5). Colorado, for example, supposedly recorded its last grizzly in September, 1951, at Starvation Gulch in the upper Rio Grande. Although Schneider (1977) still showed grizzly populations in 1900 on the prairies of Alberta and southern Saskatchewan, and southwestern Manitoba (Figure 4), it is doubtful that there were

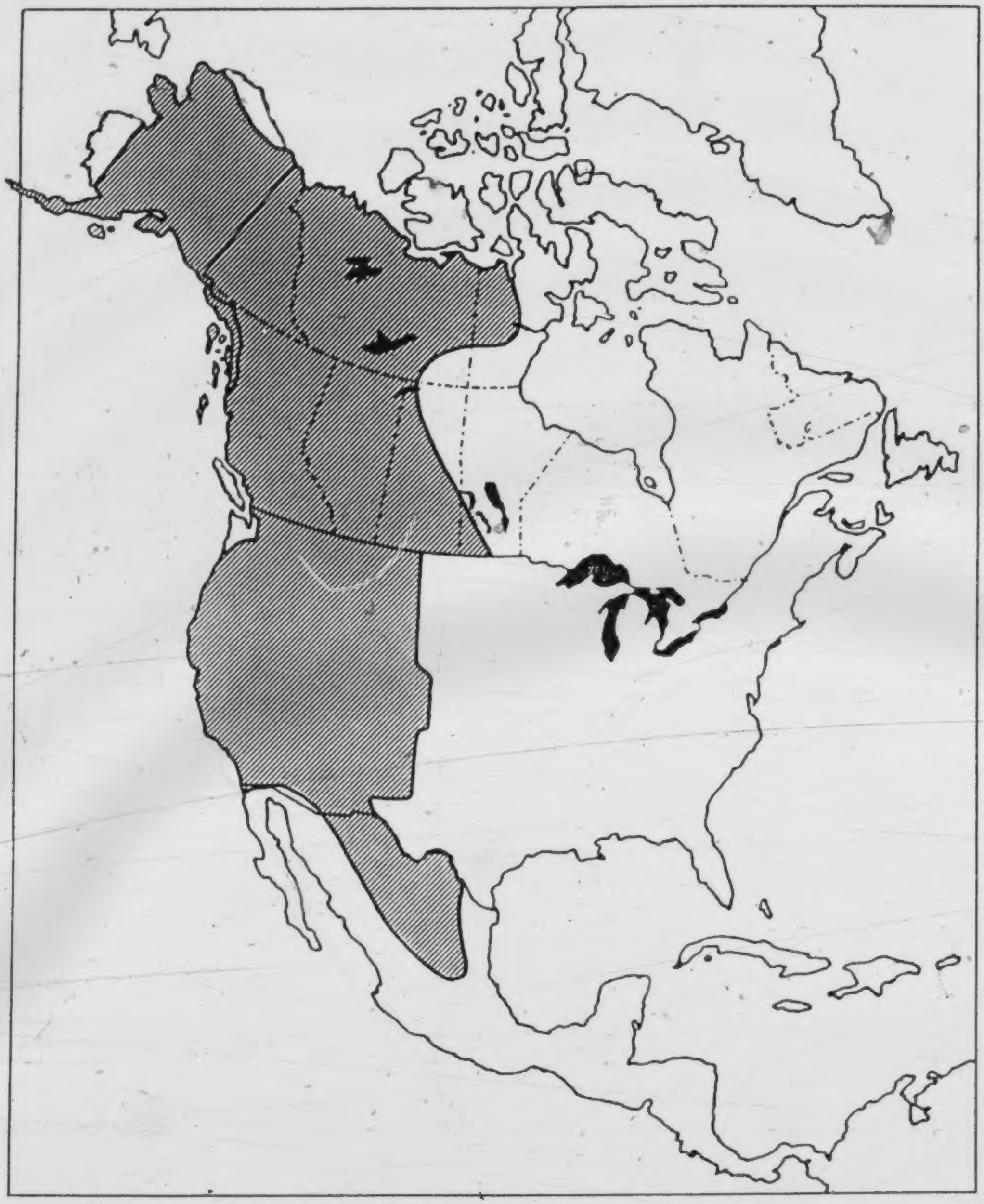

Figure 4

Grizzly Bear Distribution- 1900 (adapted from Schneider 1977) any remaining prairie grizzlies after the turn of the century in this area. The Canadian version of the prairie grizzly also slipped into extinction without comment.

Currently, there exists only three or four remaining breeding populations of the grizzly below the 49th parallel (Figure 5). One population is in the Yellowstone ecosystem estimated to be less than 200 grizzlies; second is the Glacier National Park — Bob Marshall Wilderness Area estimated to contain less than 400 grizzly bears. Third is a very small population in the Cabinet—Yaak mountains of western Montana and northern Idaho, and fourth is a small disjunct population in the Sierra-Madre mountains in Mexico.

The lower 48 states and Mexico contain less than 700 - 1000 grizzlies (Craighead 1979; Schneider 1977; and Herrero 1985). In total today, there are only small portions of four states, two provinces, two territories, and Alaska that have grizzly bear populations remaining. This is a dramatic change from the 1800's situation outlined in Figure 3.

The historical distribution of the black bear was once very extensive (Figure 2). Historically, 49 states, ten provinces, two territories and most of northern Mexico was inhabited by black bears. Currently, the distribution situation is much the same (Figure 6). In 1985, 40 states, nine provinces, two territories and northern Mexico still reported black bear populations although the populations in most areas are not as high as in historical times. In summary, the grizzly seemed to immediately capture the attention of the early settler and thus was subjected to intense feelings and slaughter, while the black bear was not considered in this same light.

2.2 The Contemporary Perspective of Bear-Visitor Conflicts

Herrero (1970) conducted a comprehensive study of grizzly-visitor conflicts during the period 1872 to 1973. Since that time no further comprehensive studies have been undertaken. There are no known systematic studies of either black or grizzly-visitor conflicts outside the national parks in North America. However, Cramond (1981) provided a listing of at least 260 attacks-fatalities due to blacks and grizzlies. Herrero (1970, 1976) reported that most attacks by grizzlies were preceded by hiking, involved some form of unintentional provocation by the

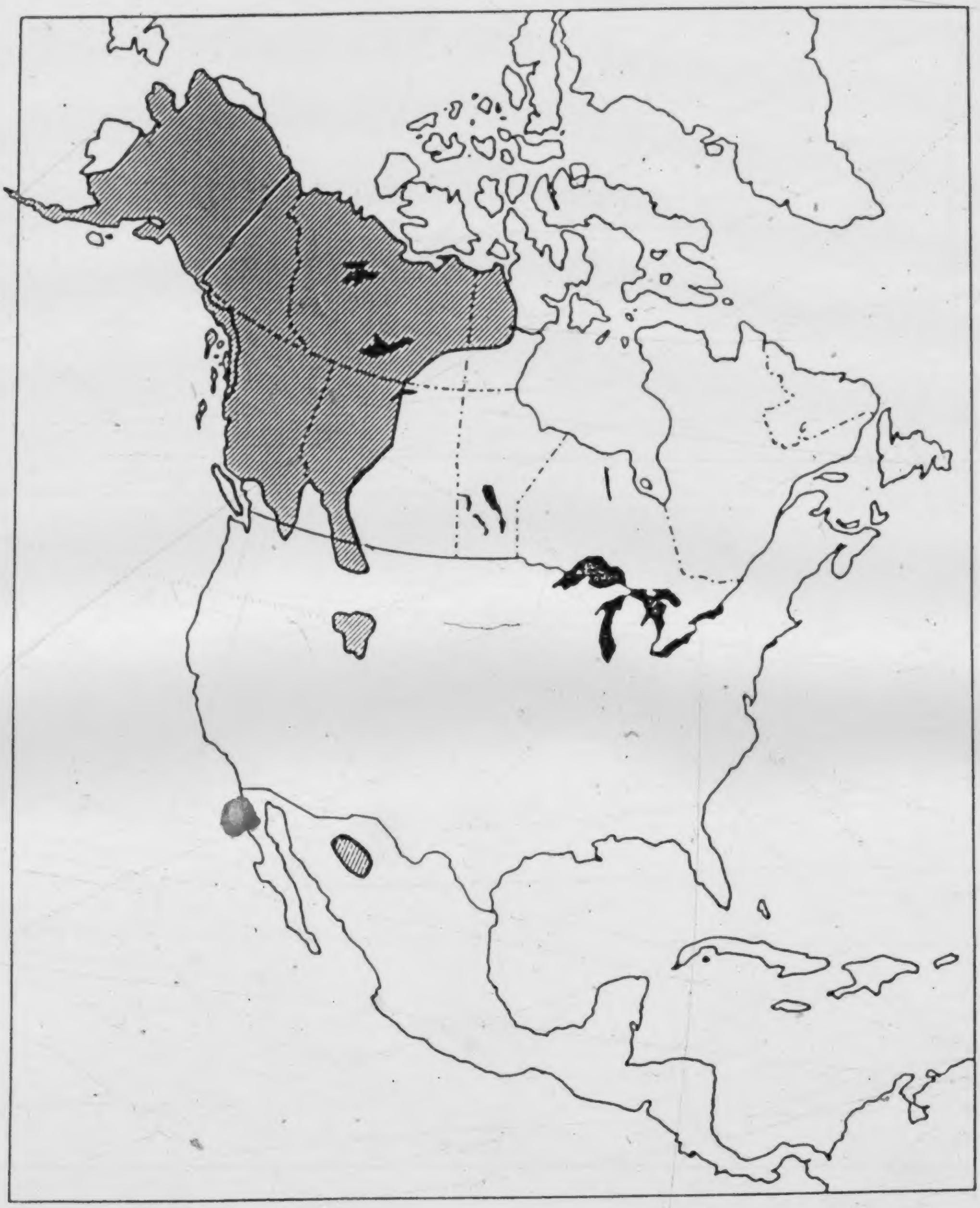

Figure 5

Grizzly Bear Distribution - 1985 (adapted from Herrero 1985)

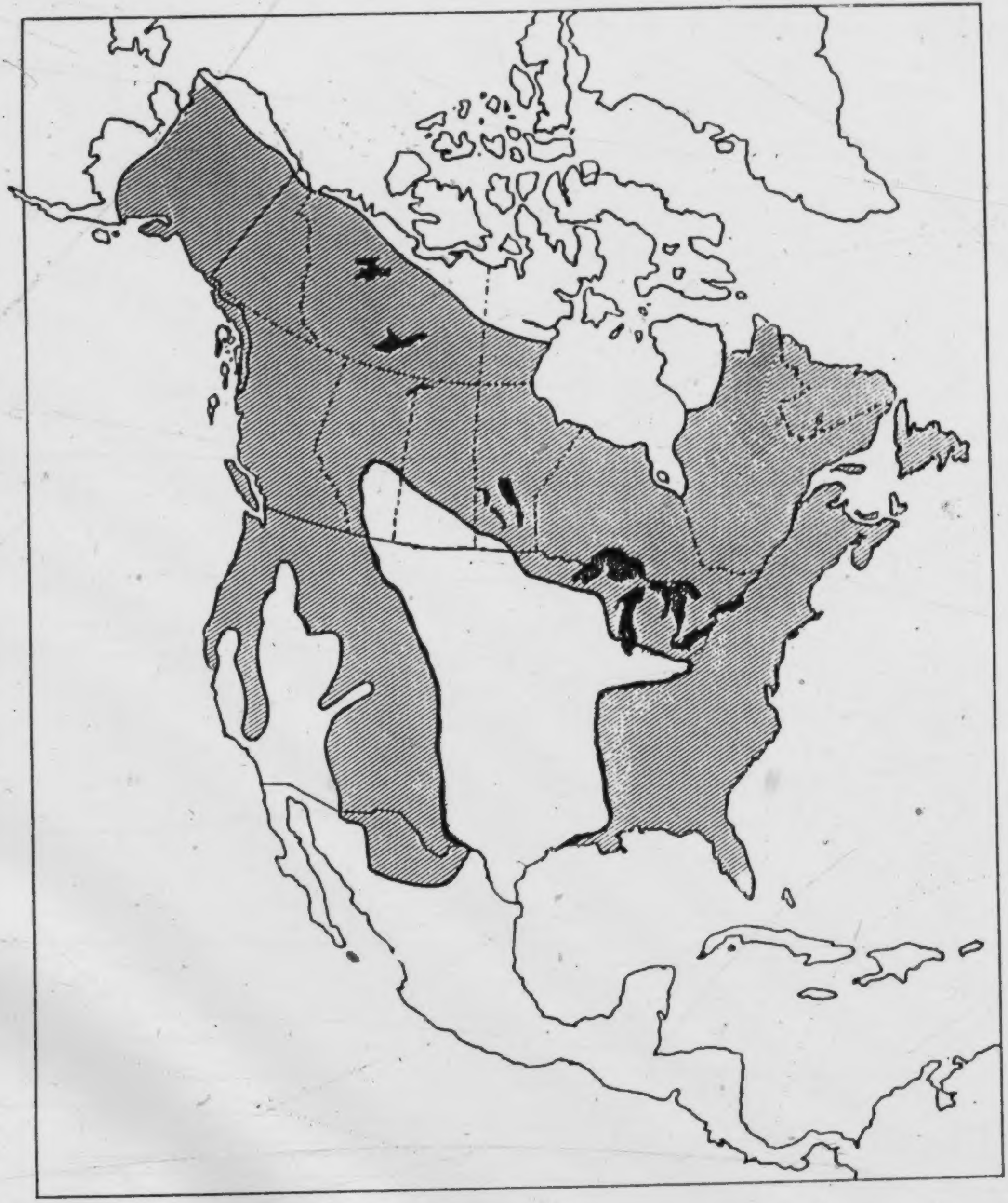

Figure 6

Black Bear Distribution - 1985 (adapted from Herrero 1985) human, such as sudden surprise encounters when the parties were within 91 m (often the distance was less than 30 m). This type of a "surprise encounter" has been classified as "defence reaction" by Martinka (1972). According to Herrero (1976), female bears with cubs were the most dangerous sex-age class of the grizzly and were responsible for a much greater percentage of confrontations (minimum 71%, 1872-1969; minimum 79%, 1970-1973), as compared to their usual portion (17 percent) within a population.

Another sex-age class that was identified as being disproportionately responsible for confrontations were very old grizzlies (Herrero 1976). Once grizzlies lose their ability to forage, often due to excessive tooth wear, they turn to garbage or areas frequently used by man. In Alaska, on two occasions, visitor deaths-injuries were known to have been inflicted by very old grizzlies with teeth worn down to the gum line.

2.2.1 Bear Behavioural Considerations Relevant to Visitor Safety

Habituation is the process whereby bears undergo a behavioural change due to some frequently occurring event in their environment, in this case, just simply encountering large numbers of people. If habituation occurs, it would have to be within the parameters of the bear's natural behavioural activities; the behaviour of bears is an important process by which they adjust to environmental changes, with the regulation of bear numbers occurring through an integration of behaviour and nutritional factors (Stokes 1970; Martinka 1974, 1976; Kemp 1976; Rogers 1977; Nagy and Russell 1978; McArthur-Jope 1983). It was not uncommon for grizzlies and blacks to adjust their behaviour in order to use more fully seasonally concentrated or locally abundant food sources (Hornocker 1962; Troyer and Hemsel 1964; Craighead and Craighead 1972; Egbert and Stokes 1976; Martinka 1976; Herrero 1978; Singer 1978). The process of behavioural change had a pattern of initial avoidance and/or flight, with the actual encounters involving high levels of aggression. Some of the results of this process are dominance or special relationships (Stonorov 1972). The bears that remained at these food sources were able to adapt to frequent social contacts by modifying their behaviour.

"Bears may habituate to people when such habituation results in access to a source of natural food in the vicinity of human-use areas" (McArthur-Jope 1983, p. 15). This gives support to the concept that in natural populations bears will modify behaviour in order to secure food resources. Habituation to other bears was observed (Egbert and Stokes 1976; Hornocker 1962) in sub-adults and lone male adults. It is evident that some bears can and do habituate when food sources are involved.

There are many possible ways visitors may affect the food supply of bears. First, visitor use may be concentrated in an area of prime bear-feeding habitats. Second, visitors may directly provide a food source to the bears in the form of garbage. In both cases it requires the bear to have increased contact with visitors.

It was reported by Jonkel (1970), by Craighead and Craighead (1972), and by Martinka (1976) that if given a chance, bears preferred to avoid visitors. However, due to the habituation by bears to people, this pattern of avoidance may no longer be the preferred behaviour. McArthur-Jope (1983) suggested that a pattern other than avoidance behaviour may be operating in Glacier National Park (U.S.A.). In this two-year study, McArthur-Jope assessed the behavioural activities by bears when encountering visitors. Two areas were intensively studied: one, a high visitor-use area, the other, a remote area with low visitor-use. In the study area, the grizzly-visitor interactions involved a large number of bears that were observed to ignore or walk toward visitors they encountered. Females with cubs showed little habituation toward visitors, both in the study area and in the control area. However, adult and sub-adult bears showed a degree of habituation to visitors in the study area as compared to the control area. In the control area, avoidance of visitors continued as the main response to people, while in the study area, neutral or approach responses became the most common bear-visitor interaction. These bears were not feeding on garbage, so one can assume that they needed the habitat in and around developed areas. Based on this evidence, the only way the bears can use this habitat is to habituate to the presence of visitors.

It has been pointed out many times that bears in natural situations will modify behaviour toward other bears to secure access to food resources. This same process has been described in behavioural terms in Glacier National Park involving visitors rather than other bears.

2.2.2 Changing Bear Behaviour and Its Possible Influence to Visitor Safety

Since 1967 charges by lone adult and sub-adult grizzly bears have resulted in injuries to hikers in the national parks. During this same time-period, two other events appeared to be happening: first, an increased rate of visitor injuries-deaths caused by grizzly bears; second, as McArthur-Jope (1983) determined, a reduction in grizzly bears' wariness of people. Although to date no direct cause and effect relationships have been shown, it is generally accepted that an increase in number of injuries to hikers was a direct result of bears losing their fear of visitors (Schneider 1977; Kittridge 1982) or was due to the increasing number of visitors in the backcountry.

A summary of the deaths due to grizzly bear maulings from 1907 through 1985 is found in Table 2. It is noted that prior to 1976 only females with cubs were responsible for visitor fatalities, (except for the 1973 case in Banff) which is in agreement with Herrero's (1970, 1976) observations that very seldom were male bears ever involved in mauling a human. However, since 1976-77, most of the fatalities have been attributed to male bears. It was the pattern prior to 1976 that man-visitor bear encounters were typically surprise encounters involving females and cub(s) at close range or attack by old bears (Herrero 1976). This has not been the case since 1976. These male bears, as far as can be determined, were not surprised at close range nor were they necessarily old or in poor physical condition. These attacks generally did not follow the pattern reported by Herrero (1970, 1976). There are three possible explanations for this behavioural pattern in the males: one, as a result of contact (researchers and others) and habituation, the bears are competing more directly with visitors "as a bear;" two, as a result of habituation, visitors are getting close enough to the bears to violate the individual distance, resulting in attacks rather than bluffs or threats (McArthur-Jope 1983); and three, by virtue of

Table 2. Summary of 15 Fatalities Caused by Grizzly Bears in the Parks of North America 1907-1984

Year	Park	Victim	Sex of Bear
1907	Yellowstone	male	female/cub(s)
1916	Yellowstone	male	female
1929	Jasper	male	female/cub(s)
1967	Glacier (U.S.)	female	female
1967	Glacier (U.S.)	female	female
1972	Yellowstone	male	female
1973	Banff	male	male
1976	Glacier, B.C.	female	female
1976	Glacier (U.S.)	female	male
1977	Waterton	female	female
1980	Glacier (U.S.)	female	male
1980	Glacier (U.S.)	male	male
1980	Glacier (U.S.)	male	male
1980	Banff	male	male
1984	Yellowstone	female	?

Adapted from Parks Canada (1985), Cramond (1981).

the sheer density of visitors in all types of bear habitats more segments of the bear population are forced to associate with visitors.

Park management practices dealing with visitor-bear interactions range from extermination of the bears to total area closures. Past and present management applications includes bear monitoring, removal, destruction of "problem" bears, distribution of information on bear ecology, proper camping practices, and closing of trails and campsites frequented by bears. Most, if not all, of these management practices are in the reactive mode.

2.3 Parks Canada Policy and Guidelines Concerning Bear Management

In 1980 the Honorable Minister Hugh Faulkner signed into effect a new policy statement detailing the future mandates for Parks Canada as a governmental agency. The primary function of this new policy is to provide a comprehensive guide for future initiatives and for a more detailed policy statement on specific program areas. The 1980 policy contains the following statements relevant to Parks Canada and bear management.

> "Program objective: To protect for all time those places which are significant examples of Canada's natural and cultural heritage and also encourage public understanding, appreciation and enjoyment of this heritage in ways which leave it unimpaired for future generations (Parks Canada 1980, p. 11)."

The term "heritage" means an inheritance or legacy of things of value that hopefully will be or have been passed from one generation to the next.

> Section 1. Program Policy on Protecting Heritage Resources. "Parks Canada will make protection of heritage resources its primary consideration (Parks Canada 1980, p. 12)".

This protection will and must be regarded as a prerequisite to use. The mandate is very direct and clear about the relative relationship between preservation and use.

Concerning national parks, which is one of the specific program areas under the control of Parks Canada, the 1980 policy goes on to further outline the mandate as follows:

> Parks Canada Objective for National Parks: "To protect for all time representative natural areas of Canadian significance in a system of national parks, and to encourage public understanding, appreciation and enjoyment of this heritage so as to leave it unimpaired for future generations".

> Section 3.0 Protecting National Park Resources". . . . Within national parks, effort is directed towards protecting our natural heritage by maintaining the physical environment in as natural a state as possible . . . The natural and cultural resources of a national park must be protected from the effects of man's activities so that they can be left unimpaired for future generations".
>
> Section 3.2 Resource Protection. "Natural resources within national parks will be given the highest degree of protection to ensure the perpetuation of a natural environment essentially unaltered by man".
>
> Section 3.2.1 Resource management. "Natural resources within national parks will be protected and managed with minimal interference to natural processes to ensure the perpetuation of naturally evolving land and water, environment essentially unaltered by human activity (Parks Canada 1980, pp. 38 and 41)".

The above policy statements indicate a strong mandate toward protection of the nation's natural resources found in national parks. Both the black and grizzly bears are important components of these natural resources.

In the national parks, it is government policy that there be management guidelines prepared for, among other things, the protection and management of bears. Guideline 4.4.15 (Parks Canada 1983), Bear Management in National Parks, is circulated to park staff to give direction as to how bears are to be managed. The following is a summary of this guideline:

1. Visitor activities within the natural habitat of bears will be managed to promote the regulation of bear populations by natural processes and to limit the frequency of visitor-bear conflicts.
2. Attractants that alter the natural distribution of bears will be eliminated where possible.
3. Visitor information programs will continue to educate park users toward acceptance of bears as one of the natural factors inherent in a wilderness experience.
4. Conflicts between bears and other park interests will be resolved without destruction of the animal.
5. A bear management plan should be produced in parks containing bear populations and should identify
    a. research requirements
    b. a detailed bear monitoring program
    c. facilities needing relocated or removed

   d. training requirements
   e. implementing procedures
   f. an outline of individual responsibilities

   Of special note: public education is not identified as a part of the bear management plan.

6. Address garbage collection, handling and disposal procedures.
7. Planned park facilities should be assessed as to impacts on bears.
8. Superintendent may limit the number of hikers on trails, remove visitors from specific areas, post warning signs, regulate visitors in any way necessary to prevent visitor-bear conflicts.
9. Visitors should be warned of the potential dangers in being around bears.
10. Bear relocations should be considered only as a short term corrective procedure.
11. Bears should be destroyed only if:
   a. the bear is immediate threat to the visitors life
   b. the animal is seriously injured or ill
   c. the bear is potential threat to visitor safety and other measures have failed.

2.3.1 Western Regional Environment Parks Canada Directives

In similar fashion, the regional office has initiated some management directives. In March, 1981, Western Regional Directive 38, Bear Management in National Parks was issued (Parks Canada 1983). This directive refined the previous management guidelines on bears and indicated that a bear management plan will be prepared for each park having bears, and that the plan would be reviewed annually.

Waterton Lakes National Park personnel then, in keeping with both the National Guidelines and Western Regional Directives, have prepared a bear management plan.

The goals and objectives of the Bear Management Plan for Waterton Lakes National Park are as follows:

> The regional policy for bear management is to lend the greatest possible protection to the public, while maintaining a healthy and natural bear population. The specific goal of Waterton Lakes National Park in its Bear Management Plan is to identify the proper preventative measures in avoiding bear/human conflicts and to provide adequate management actions to ensure public safety and protection of the bears (Parks Canada 1981, p. 2).

Public safety is cited as the primary goal of the Bear Management Plan for Waterton Lakes National Park, whereas, the National Park Policies make the protection of heritage and natural resources as the primary goals to be achieved. The specific objectives for the Waterton Lakes National Park Bear Management Plan are as follows:

> 2.2 Objectives
>
> 2.2.1 Minimize the rate of bear-visitor incidents and prevent it from accelerating.
>
> 2.2.2 Provide to all park employees vital information on bears and their management.
>
> 2.2.3 Alert visitors and potential visitors to the presence of bears and the inherent dangers of travelling in "bear country". Inform visitors how best to minimize risks and enjoy a quality experience.
>
> 2.2.4 Provide information and enforcement so that all visitors will adhere to proper food and garbage handling requirements.
>
> 2.2.5 Enforce proper food and solid waste disposal regulations for all residents and business establishments.
>
> 2.2.6 Continue research in order to obtain improved management techniques.
>
> 2.2.7 Provide specific guidelines for bear handling.
>
> 2.2.8 Establish standard procedures for area closures and openings.
>
> 2.2.9 Establish a monitoring program and record all bears sightings in Waterton Lakes National Park as a method of determining trends useful in developing bear management plans. This includes cooperation with Glacier National Park, U.S.A., and the Provinces of Alberta and British Columbia.
>
> 2.2.10 Support research on bear behaviour and/or adversive conditioning.
>
> 2.2.11 Initiate operations soon enough to ensure successful return to the wild by garbage bears.

Even though managers may technically do all the right things, the problem of bears habituating to the presence of visitors is possible. Therefore, in the future, new techniques need to be developed that will measure this habituation process which, when known, will be another parameter in determining the visitor carrying capacity of a bear population, and will allow corrective behavioural modifications.

3. THE APPLICATION AND RELEVANCE OF ATTITUDINAL AND PERCEPTIONAL RESEARCH TO BEAR-VISITOR COEXISTENCE

3.1 The Need for Attitudinal Research

The National Parks Act of 1930, as amended, is the legislation under which the parks are administered today. Section 4, of the act states the general purposes for the national parks as: "The Parks are hereby dedicated to the people of Canada for their benefit, education and enjoyment, subject to the provision of this Act and the Regulation, and such Parks shall be maintained and made use of as to leave them unimpaired for the enjoyment of future generations (Chayer 1970, p. 5414)."

As stated in the act, there is a dual mandate for use and preservation. The national parks are not only to be used in the present but also to be held in trust for future generations. The manager's position is one of being a steward or trustee of the national parks. Stewardship as a basis for park management is quite different from utilitarian concepts. Trusteeship means to hold in trust for the public, whereas the utilitarian concept means to use and extract the resources for economic benefit. Park managers have been given a mandate which asks them to be trustees for all the wildlife and resources within the parks.

Much has been written about the benefits and value of wildlife in the national parks, but considerably less has been written about park visitors and their attitudes and expectations concerning wildlife. Shaw and Zube (1980) gave an overview of the types of information needed about the public's psychological, social, economic and ecological values regarding wildlife. Knowledge about these values is needed for adequate environmental decision-making. Filon *et al.* (1983) added that wildlife management agencies across Canada recognize the need to understand better the nature, extent and importance of interaction between wildlife and human populations. A better understanding of these interactions is required to aid management agencies in the planning and evaluation of wildlife policies, programmes and in the protection of wildlife habitats. Henning (1970, p. 11) stated that natural resource managers, including park managers "are basically concerned with management of people's behaviour toward natural resources, rather than natural resources per se." He concluded by indicating that in making sound resource management decisions, managers must include people and their values.

Hendee and Schoenfeld (1973), also gave support the need for basic human behavioural research because wilderness - wildlife management is in large part people management. It is important to understand human perception, attitudes, and beliefs because they are related to improving human behaviour. Moore (1977) supported giving visitors properly conducted interactions with the environment which can increase the visitors' knowledge about wildlife. These visitors may return to the site with enhanced knowledge and be responsible users. They may also spread their information, attitude, and improved behaviour to an off-site acquaintance or inexperienced on-site user. Properly conducted interactions can open up sensitivity to and concern for relevant environmental problems (Knudson 1978).

In the case of bears, the whole bear-visitor interaction and its impact on visitor behaviour and management must be better understood. The bear "problem" may be in large measure one of visitor attitudes. The resolution to the problem of bear/human interaction will be found by changing man's attitude rather than attempting to "kill off the bears" (Caras 1969, p. 55). Mihalic (1974) felt that we can assume that the visitor's behaviour has contributed to a large portion of the damages and injuries sustained by bears. "This suggests that perhaps the answer to bear/human problems lies in the study of human visitor in grizzly country, rather than traditional avenues in wildlife behaviour" (Mihalic 1974, p. 28). It is becoming very clear that visitor injury and death caused by a bear can almost always be traced back to some particular visitor behaviour.

The study of the visitor's values, attitudes, knowledge, behaviours and preferences regarding bears is of value in its application to the basic question of managing the visitor's behaviour with respect to bears. What are the basic values the visitors have toward bears? What are the basic attitudes concerning bears? What is the level of knowledge about bears and their ecology? What is the visitor's behaviour toward bears in the national park? Of most importance, is there a relationship between visitor's values, attitudes, knowledge, and behaviours toward bears? Answers to these basic questions and possible interrelationships will enable the manager to revise existing visitor management strategies and create new ones.

Surveys of the visitor's attitudes provides the data necessary for managers to know how they might respond in specific situations (Lucas and Stankey 1974). Additionally, knowledge and belief is an associated perceptual phenomena, and much research conducted on knowledge and attitude refers in part to the degree to which visitor's belief is accurate. This research approach is justifiable for a project that attempts to assess the gap between perception and reality in order to recommend appropriate management or educational actions (Hastings 1986).

3.1.1 Definitions and Terminology

Prior to entering into a detailed discussion of perceptions, attitudes, beliefs, values, knowledge and preferences, some definitions are needed. Perception is a process, act, or result of understanding or becoming aware of something directly through the senses, or in one's mind. Perception has also been described as the development of meaning resulting from past and present sensory input (Leukel 1976). Thus, perception is highly diverse, ranging from a minor or insignificant insight to an overall understanding or disposition toward a class of related subjects (Hastings 1986). Perception is the very general idea or feeling about a class of related subjects. Attitude can be considered as a particular disposition, or state of mind, or feeling with regard to some particular matter in a range of related subjects. Bem (1970) defined attitudes as likes and dislikes.

Belief is the information that a person has about a particular object or situation, a conviction or acceptance that a certain thing is true or a refined representation of the information and experiences held. Belief is a distinguishable pattern of related ideas (LaHart 1978). Thus, beliefs often influence decision making (LaHart and Barnes 1978). Beliefs are not attitudes, but are specific propositions with which we can agree or disagree. Belief does not imply anything about tendencies to act (attitude does) and does not include positive-negative types of evaluations that are the basis for our attitudes (Mihalic 1974). Hastings (1986) indicated that beliefs are convictions of the truth or reality of some statements, being or phenomenon.

Hastings (1986) and Witter (1980) have reported that values are used to encompass attitudes, preferences, and any other psychological, social, or behavioural patterns that reveal anything about the importance the person has attached to a series or class of objectives. Milbrath and Sahr (1975) also stated that values are more general in nature than attitudes and that values suggest or imply a hierarchical order. Values are involved with establishing priorities and evaluating the relative importance between two objects, processes, or situations.

Knowledge can be considered as the sum or range of factual information which the person has learned, perceived, or inferred (Hastings 1986). Knowledge then is closely tied to beliefs, behaviour, preferences, and possibly even attitudes. Kellert (1983) considered knowledge of animals as involving not only cognitive perception but also an evaluative perception. The cognitive component refers to the factual understanding of a situation, object, or process, while the evaluative aspect refers to the belief and value of a situation, object, or process.

A preference can be justified as a selection of one thing over another, something so chosen, or state of being better liked or more valued (Hastings 1986).

At this point one may ask: is there really any difference between perception and attitude, belief, value, knowledge, and preference? One of the reasons that these terms may have similar definitions is the different definitions and terminology used by the various investigators (LaHart 1978). The approach taken in this dissertation is the same as Hastings (1986) that attitudes, beliefs, values, knowledge, and preferences, as well as combinations of these variables, can be either types or components of perceptions.

3.1.2 Attitudes about Animals

Some researchers have been concerned with the general public's attitude about animals, including wildlife and how the these attitudes relate to the human-animal relationship. In a national study in the USA, Kellert (1979, 1980a) developed a typology that describes the public's attitude toward wildlife. Specifically they are:

Naturalistic: Primary interest and affection for wildlife and the outdoors.

Ecologistic: Primary concern for the environment as a system, for inter-relationships between wildlife species and natural habitats.

Humanistic: primary interest and strong affection for individual animals, principally pets.

Moralistic: Primary concern for the right and wrong treatment of animals, with strong opposition to exploitation or cruelty towards animals.

Scientistic: Primary interest in the physical attributes and biological functioning of animals.

Aesthetic: Primary interest in the artistic and symbolic characteristics of animals.

Utilitarian: Primary concern for the practical and material value of animals or the animal's habitat.

Dominionistic: Primary interest in the mastery and control of animals typically in sporting situations.

Negativistic: Primary orientation — an active avoidance of animals due to indifference, dislike, or fear.

Neutralistic: Primary orientation a passive avoidance of animals due to indifference.

These ten attitude categories will be used when assessing the public's attitudes toward bears.

3.1.3 Attitude Theory

Bem (1970) defined attitudes as likes and dislikes. This is perhaps the simplest definition of attitude. Thorsell (1967) defined attitudes as a simple undimensional concept: the amount of affect for or against a psychological object. Neither of these definitions has indicated the complexity of attitudes or their strengths. Allport (1967, p. 8) offered a definition of attitudes as "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon individual's response to all objects and situations with which it is related." Deese (1967, p. 492) used Allport's ideas and definition of attitudes to state that "attitudes are general dispositions which stand behind our evaluation and emotional feelings."

An attitude has also been defined as a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given particular object (Moore 1983; Zanden 1984). Attitude is in the specific orientation or desposition, while perception remains the general orientation or desposition. Moore (1983) further indicated that attitude is a refined representation of a belief. The difference between attitudes and beliefs is that attitudes include evaluations of an object or situation in question while beliefs do not (Hastings 1986). He further indicated that while an attitude may describe some element of a person's perception, all of someone's behaviour will not be explained by just one attitude. In all of these definitions it is important to note that an attitude was defined as being of a generalized nature and forming basic value structure from which evaluations about life's experiences were formed. These definitions do not address the issue of how the attitude is learned, or how long it endures, and if it changes through time.

Rokeach (1970, p. 112) indicated that attitudes are a "cluster or syndrome of two or more interrelated elements -- they are underlying beliefs which are organized around an object or situation predisposing one to respond in some preferential manner". Rokeach made a distinction between beliefs and attitudes. This is important since a belief is not an attitude, but rather a proposition with which we can agree or disagree (Mihalic 1974). Rokeach (1970) indicated further that beliefs do not imply or indicate a tendency to act, whereas attitudes do, and beliefs do not indicate the positive-negative type of evaluation that is the basis for attitudes. Belief systems defines the probability dimension of a concept about that particular subject area while an attitude reflects the evaluation dimension about the belief. The beliefs are in a large part feelings about concepts or propositions, while attitudes add the evaluative dimension, e.g., good-bad, indifferent, pleasure-pain and morality. Further, there is a basic difference between belief in a concept and belief about a concept. Changes in attitude towards a particular concept in reality are changes in belief about the particular concept (Fishbein and Ajzen 1975). Thus, the observable attitude of an individual is in reality the result of how that particular individual believes about a particular set of concepts.

Moore (1983) agreed with LaHart's (1978) recognition of the cognitive (e.g., factual knowledge) and affective (e.g., evaluation) components of behaviour, but went on to add the behavioural component. Moore felt that there is a relationship between the affective feeling toward the animal (correct or not) relative to the cognitive component and a tendency to act in a given manner toward an animal corresponded to the behavioural component.

Kellert (1983) also specified three components of perceptions which are notably important to human-animal relationships: cognitive, affective, and evaluative aspects. The cognitive component refers to knowledge and factual understandings of animals; the affective component refers to the level of feelings and emotions attached to animals or situations; and the evaluative component concerns beliefs and values associated with the animals. Kellert (1983, pp. 242-243) states that:

> Knowledge and awareness of animals can be regarded as involving cognitive perceptions primarily, evaluative views secondarily, and least of all, affective perceptions. Symbolic views of animals, on the other hand, are mainly affective, evaluative in a secondary sense, and least subject to cognitive understanding of animals. Finally, attitudes appear to fall in between the other two areas -- that is, they are most strongly influenced by values and beliefs of animals (the evaluative perspective), but also reflect cognitive and affective perceptions.

These three components (e.g., affective, cognitive, and behavioural) of attitude are not always necessarily interconnected or sequential. An attitude may be present but may or may not always lead to a particular behaviour. There seems to be a general confusion about whether an attitude will always result in the prediction of an overt behaviour. The overt behaviour happens only when an appropriate intensity level has been reached in the individual and an opportunity occurs for its expression. Kliejnas (1969) inferred that the confusion about the attitude-behaviour relationship is a result of the few studies that have attempted to predict overt behaviour from knowledge of verbally expressed attitudes. Studies have tried to measure the affective component, usually defined as some feeling or some emotional response (love, hate, fear, etc.). Heberlein (1973) indicated that these measures of the affective component of behaviour were usually sets of choices presented to the visitor and were associated with an attitude about some object. The visitor was asked to indicate a like or dislike about each object. The visitor's answers were then used to measure the like-disliking of the objects. Heberlein (1973, p. 2) stated, "This sort of methodology measures more of the subject's cognition [factual knowledge component] than his emotion or affect [affective component]". In measuring the affective component of attitudes, it is necessary to identify both belief in and about the concept(s) with an indication of the intensities involved.

Reliable prediction of visitor behaviour was possible, but was best made from attitudes that were well-formed. An attitude is well formed when all of its components (e.g., cognitive, affective, and evaluative) achieve a balance which persists over time (Moore 1983). However, attitudes often do not stabilize, but can change over time, because one or perhaps all three components are undergoing some change. Thus, predicting a person's behaviour during the time when these components have not stabilized may be very difficult.

Pirt (1976) suggested that before a person will behave in a particular way there must be the motivation and the opportunity for its expression. For this reason visitors often do not behave in a manner consistent with their stated attitudes. Bryan (1980) felt that another reason for the inconsistency was that the real situation was sufficiently compelling as to override the attitude.

Other researchers, Kliejnas (1969), and Rokeach (1970) indicated that a visitor's overt behaviour was influenced by at least two attitudes: toward an object and toward a particular situation. One cannot split attitudes toward an object or situation when trying to predict a visitor's behaviour because "an attitude about an object is always encountered in a particular situation, about which we also have an organized attitude" (Rokeach 1970, p. 119). For this reason any attempt to predict overt behaviour accurately on the basis of a single attitude toward an object may result in inconsistencies between at for something like free-ranging bears must be examined during the time when the visitors were in the same habitat with the bears. An examination of the attitude-behaviour or knowledge-behaviour relationship away from the habitat occupied by free-ranging bears will not include the attitude about a particular situation. For this reason in the present study it was important to study this relationship in the actual setting of the park.

3.1.4 Attitudes, Knowledge, and Behaviour

In the event that the visiting public has developed attitudes that are not based upon knowledge or experience, any effort to change those attitudes by providing knowledge or experiences related to wildlife, including bears, may meet with limited success.

Attitude formation, behaviour modification, and the increase of visitor's knowledge are often listed as objectives for many environmental education programs. It seems that there is an assumption that attitudes affect behaviour and that knowledge in turn affects attitudes (Burrus-Bammel 1978). Hendee called these assumptions the folklore of environmental education and pointed out the need for investigation and research (Hendee 1972). Others, such as Wicker (1969, p. 49) concluded that, "it is considerably more likely that attitudes will be unrelated or only slightly related to overt behaviours than that attitudes will be closely related to action." Abelson (1972) severely questioned whether information had any effect on behaviours.

The actual process of moulding desirable attitudes and behaviours may be more than just a factual information delivery system. It has been assumed that if people have the facts and technical knowledge about a particular resource, they become concerned and display the desired attitudes. This model has been successful only when two conditions exist: first, the visitor must already have some emotional feeling or concern about the issue; and second, the visitor must have a feeling that he can do something about resolving the issue (Butler 1980; Swan 1977). Often the process of teaching the facts and information has been one of learning the facts. The true measure of a wildlife evaluation program should not be the amount of factual information learned, but the development of respect and common concern for wildlife and the environment (Kellert 1983).

The knowledge-attitude relationship was the subject of a research project in a summer forestry camp in West Virginia for 16–20 year olds. It was clearly shown in the linear regression of various group scores that attitude was not correlated with knowledge (Burrus-Bammel 1978).

Additional investigations have shown that increased knowledge does not necessarily produce a positive attitude toward wildlife or a wildlife-related issue (Alvord 1972; Iverson 1975; LaHart 1978; Moore 1983). LaHart (1978) concluded that while knowledge and attitudes are related components of environmental perception, they have little influence on each other. Hastings (1986) and Moore (1983) found that visitors with positive attitudes about animals may not be very knowledgable about the animals, while those with a great deal of knowledge about animals do not necessarily approach the animal world in a favourable manner. Moore (1983) established that attitudes were related to behavioural intentions and beliefs, and that knowledge was also related to beliefs, but that knowledge wasn't highly correlated with attitudes.

Moore (1977) described three major types of wildlife experiences: direct natural experiences (e.g., as in Waterton Lakes National Park), direct artificial experiences (e.g., zoo), and vicarious experiences (e.g., film). Waterton Lakes National Park provides an opportunity for visitors to have all three types of experiences with a number of species. Viewing animals in their natural habitat can be very educational. Viewing animals in natural habitat can be aided by interpretive and media systems (Cooper and Shaw 1979). Such information not only enhanced viewing opportunities but improved the visitor's awareness and appreciation of wildlife and wildlife ecology (Sharpe 1976). Brochures, radio messages, bulletin boards, etc. can help visitors to understand more about what they are seeing and how animals fit into nature (Hastings 1986).

There is increasing recognition that not all knowledge will automatically and quickly lead to a favorable attitude and behaviour. "Attitudes and values take time to mature; environmental literacy is no short course" (Kellner and Waupinski 1974, p. 27). However, it has been recognized that the manner in which ecological material is presented will make a difference

(Dushane 1974; Hepburn 1974; Hepburn and Keach 1974). There is the general assumption that, "a broad public literacy of biological and ecological concepts is at the heart of defining, reclaiming and maintaining environmental quality" (Rubin 1974, p. 61). This knowledge about ecology can be taught, but the results have been variable, sometimes resulting in little or no change in attitude or practice (Rubin 1974).

There was a second inactive group which were identified as indifferent (Barnard 1938). The third group was at the opposite extreme, identified as people who had a high degree of knowledge and possessed activist-attitudes as well as a commitment to some issue (Ramsey and Rickson 1976).

Fortier (1983) found that the more knowledgeable visitors at Yellowstone National Park exhibited attitudes more complementary to bear management objectives than low-knowledge visitors. However, it was not known whether the knowledge actually changed attitudes or whether attitudes led to the desire for further knowledge. Ramsey and Rickson (1976) recognized a relationship between knowledge and attitudes. They felt that neither solely caused the other; rather some knowledge may have led to the initial formation of attitudes which, in turn, led to further gains in knowledge and so on. They found a positive correlation between knowledge and attitudes. However, the correlation was not a straight-line relationship.

The relationship between these items suggested that general non-specific information was questionable when trying to change attitudes, although the methods used to present information on environmental issues did significantly change visitors' attitudes (Bowman 1975).

It should be possible to teach attitudes rather than just expecting the acquisition of knowledge to automatically lead to improved attitudes. Ramsey and Rickson (1976) felt that although a visitor could certainly be taught environmental attitudes their development takes much longer than the learning of the facts. Hastings (1986) also indicated that agencies should clearly state the objectives and goals involved with educating the visitor about wildlife and wildlife management. If the agency wishes to change both knowledge and attitudes, then both should be presented in educational programs and not assume that one will automatically influence the other.

The relationship between knowledge and attitudes is complex with few direct cause and effect relationships. The following examples from Kellert's (1980b) study are noted: first, when scientific study users were compared to zoo visitors, the knowledge levels of wildlife were significantly different, yet both groups displayed high moralistic attitudes toward wildlife. Secondly, scientific users, birdwatchers and trappers all had the highest level of knowledge about wildlife, yet the trappers and birdwatchers were extremely different from scientific users when considering moralistic attitudes.

When considering other types of environmental issues, Pettus (1976) reported that being better informed did not mean visitors would be more favorable toward enforcement of environmental controls to help improve environmental problems. Specifically, he found that:

1. There was a level at which more formal education and environmental control ceased to cause visitors to be more favorable toward restrictive measures for improving environmental quality and, in some cases, may be inversely related;
2. Work and living conditions have significant effects upon the acceptance of environmental controls and, probably, participation in constructive environmental activities;
3. Cultural and sub-cultural beliefs and backgrounds played a large part in the development of environmental attitudes;
4. Some environmental attitudes influenced or precluded the development of other environmental attitudes; and
5. Private environmental attitudes were independent of public environmental attitudes and may be more difficult to change.

Ramsey and Rickson (1976, p. 10) noted a positive correlation between knowledge and action promoting better environmental quality. They also noted that "whether the attitudes lead to increased knowledge or the other way round is not clear, but the two variables probably interplay."

3.1.5 Knowledge, Attitudes as an Expression of Interpretive Experiences

When considering this general area, it is fairly well accepted that exposure to interpretive programs will change attitudes. At Writing-on-Stone Provincial Park, Butler (1980) attempted to correlate visitor behaviour with the previous incidence of attending park interpretive presentations. Visitors who were exposed to an interpretive message showed a significant level of concern for resource degradation as compared to the control group. Interpretation, therefore, was concluded to be an important motivating agent responsible for a preventive reaction when encountering an act of resource degradation.

There were several other reports in the literature that have suggested that awareness and to protect resources (Jack and Zazelenchuck 1970; Bell 1973; Field and Wagar 1973; Bowman 1975; Roth and Hodgson 1977).

In the study of the knowledge and attitudes concerning bears by visitors to Great Smoky Mountains National Park by Burghardt, Hietala and Pelton (1972) reported that 40% of the visitors with high knowledge about bears had attended an interpretive message whereas only 31% of the visitors with low knowledge had attended such talks. These figures do not really indicate that the interpretive message was the means by which the knowledge was acquired.

Hastings (1986) conducted a student's t-test on each media source (i.e., brochure, radio message, naturalist talk, asked an N.P.S. Employee, exhibit, bulletin board) with each knowledge index, including knowledge of bears. There were no significant differences at $p<0.05$ for any of the knowledge indices between visitors who read the park-wide wildlife brochure versis those who did not. Even though there were no significant differences in knowledge scores according to the various sources of information, Hastings (1986, p. 193) did recommend that "visitors needed more information on wildlife and wildlife management. Although knowledge and attitudes don't always appear highly related, it was concluded that certain information could not only improve visitor knowledge but also their beliefs, thereby more efficiently altering attitudes over time."

Hastings, Gilbert and Turner (1981, p. 13) have also made a recommendation that a "high-quality 16mm movie on human-bear interactions and proper food storage in the backcountry should be produced. If it were to prove highly effective in reducing bear problems, then the park service could consider mandatory viewing by visitors before issuing wilderness permits." In this case they felt a film would be more beneficial than any other current source of information available to the visitors. The film has the advantage of not requiring interpretive staff to be on duty 24 hours a day at the backcountry permit stations. At the time of this recommendation no evidence existed as to the possible overall effectiveness of such a film.

It was assumed that interpretive programs can affect visitor's attitudes about the environment. It was also suggested that knowledge levels will affect visitor's attitudes about the environment, although it is not clearly understood if these relationships continue regarding bears.

3.2 Bear-Visitor Interrelationship Studies

Mihalic (1974) explored the visitor behaviour segment of the relationship by studying the park visitor's attitude towards grizzlies. He concluded that the visitor's attitudes were highly positive, showing an overwhelming desire to maintain a grizzly bear population in the park. About two-thirds of the visitors had positive attitudes towards the bears. The most positive attitudes of visitors toward bears were indicated by activity and aesthetic factors. For example, a positive attitude in the aesthetic dimension was indicated by the fact that the vast majority of visitors didn't want bears removed from the park. However, as previously indicated by the visitor's evaluative factor, this doesn't mean that every visitor had an overall positive attitude about bears. Mihalic was unable to determine or predict whether or not a positive attitude toward bears had any relationship to resource use. His conclusion seemed to follow the attitude theory advanced by Rokeach (1970) and others that behaviour was actually the result of two or three factors. Therefore, park managers cannot assume that the past experience of the visitor was necessarily reflected in the expressed attitude or behaviour of the visitor.

Mihalic (1974) reported that hikers and campers in general did not have a positive attitude towards bears while hunters did. This may have been in part due to the personal utilitarian value of a grizzly. A trend was reported showing that as exposure to media dealing with nature and natural resources increased, the attitudes became more positive. It was also found that biological bear knowledge seemed to have no effect on attitudes in and of itself.

Interpretation efforts by the park staff ranked low on the list of sources from which park visitors indicated that they had acquired their information about wildlife, including bears. While interpretation has been long recognized as a legitimate educational function, perhaps to educate more effectively, park staff should have been given a variety of information rather than just biological facts. It was recommended that interpretive programs should stress the value of wildlife including bears, their social relationship with other animals and each other, their effect on the land and their importance to man. In this way, interpretive activities could be used to counter the negative images given grizzly bears by the more popular forms of media. Rather than focusing on primarily entertainment and/or biological information about bears, interpretive activities could help develop a clientele that is both knowledgeable, and instilled with the respect needed for the public to coexist with a potentially dangerous animal. Thus, interpretive programs could then be used to influence the visitor or to generate support for particular management action.

Visitors with membership in environment groups, for the most part, supported the park bear management policies and had a desire to maintain bear populations, although members in these environmental groups did display some negative and neutral attitudes towards the grizzly bear.

In Mihalic's study several other intervening variables such as age, sex, education, origin (meaning birth place), urban and rural residency were examined as factors in attitude formation. Visitor's origin (during the individual's young years) had the most effect on attitude formation. This agreed with Bryan and Jansson's (1973) work which will be reviewed later. Age was the next most important intervening variable, while sex and education appeared to be very weak intervening variables.

Past experiences were found to contribute to the formation of attitudes; however, there were other intervening variables shown to be more important when considering what contributes towards attitude formation. Therefore, it was difficult to establish causal or sequential attitude formation because of the intervention of such variables as age, sex, education, and origin. Mihalic (1974) expressed the concern that there may even be other intervening variables yet to be discovered in the relationship between past behaviour and attitudes.

Further, this study also pointed out that a prediction of visitor behaviour could not be made on the basis of one attitude indicator. If there were strong intervening variables in the past, it follows that park managers should not rule out the impact of future intervening variables that might change the visitor's behaviour or attitudes in the future.

Dean (1968) observed both visitors and bears and he concluded that in addition to the seasonal shifts in location and types of activity that characterize the bear's life, there were seasonal shifts in the visitor's attitudes concerning the bears. Dean felt that bears were less tolerant when they first came out of the den in the spring. Once over the short food supply situation in the spring, the bears became placid. However, when the salmon runs were underway and the bears were competing for fishing stations, the aggressive attitude of the bears returned. However, after leaving the river and returning to vegetation and the ripening berry crop, the bears became placid again. It was during this mid-summer competition for preferred fishing stations when the visitor use was at its highest.

In Dean's study, the visitor's attitudes about the bears ranged from considering them a nuisance to a hazard. This was dependent upon the visitor's primary reason for the visit to Brooks camp; those coming to see the bears considered them very important, while other visitors coming, for example, to see the Valley of Ten Thousand Smokes (an active volcano), considered the bears a nuisance.

Bryan and Jansson (1973) conducted a questionnaire survey during 1969 and 1970, in Alberta, to determine the degree to which wildlife in the western mountain national parks were perceived as being hazardous and the factors associated with this perception. The grizzly bear, along with other animals, were all perceived as a hazard. The factors associated with the correct perception of hazards included: frequency of visits to national parks; frequency of wildlife-connected activities; type of wildlife-connected activities; knowledge level of bears; and selected socio-demographic characteristics.

It was shown that locality of the visitor was clearly related to the perception of hazards. The perception of the visitors who had visited parks more than once a year most closely approximated reality and accuracy, It was determined that many visitors recognized the existence of hazardous wildlife although they were not necessarily feeling they were personally endangered. Correct hazard ranking and perception of personal endangerment both increased as contact with wildlife increased.

Bryan and Jansson (1973) further stated that 30.4 percent of the visitors not visiting the national parks felt endangered. There was no doubt in their minds that this hazard perception was an active deterrent to park use by this group.

Visitors were asked to identify from a list of possible alternatives how they would react to encountering a bear. The possible reactions included: climb tree, run, shout, stand still, throw object, play dead, whistle, and walk away. All visitors made a distinction between blacks and grizzlies. Jasper residents had the highest knowledge levels, while frequent park visitors and big game hunters showed a high awareness of appropriate reactions. It was found that the visitor's ability to distinguish between blacks and grizzlies was low. There was a general view that bears do not kill humans for food. At the time of the Bryan and Jansson (1973) study, there were only five visitors known to have been killed by bears in the parks of North America.

Bryan and Jansson (1973) indicated that, on the basis of results, it appears reasonable to assume that increasing urbanization and decreasing contact with wildlife will reduce the accuracy of perceptions about wildlife. They encouraged better informational material be provided to avoid public pressure to destroy any wildlife that may injure a park visitor.

Hastings (1983) also stressed the need for better information because visitor fear was the most likely behaviour to precede bear aggression, while visitors that displayed a neutral approach were most likely to precipitate agonistic responses, while visitors that displayed aggressive behaviour were least likely to elicit bear aggression. Visitor fear ($p=0.002$) and neutrality ($p=0.004$) preceeded bear aggression more often than bear fear. Visitor aggression ($p<0.001$), however, preceeded bear fear more than aggression. Thus, Hasting's (1983) data suggested that being unaggressive towards a bear may increase the likelihood of precipitating bear aggression rather than fear. Photographing and running away from bears was more likely to precede bear aggression than other specific visitor behaviours. If, as Hastings (1983) suggested, that visitor behaviour may be a critical factor in an encounter, then the public needs to be informed as to what constitutes appropriate behaviour in bear encounters.

Other studies have shown a general lack of knowledge about bears. For example, the visitors to Denali National Park, Alaska, knew 74% of the information requested (Sundstrom 1984), while the visitors in Bacon's (1974) study in eastern United States knew only 48% of the answers to bear-related questions. Both studies inquired into nearly the same information about bears. Many visitors could use some improvements in their information about bears, particularly on the topic of bears and bear encounters (Hastings and Hamitt 1986). Hastings (1986) also indicated that in general, visitors were not very knowledgeable in any of the six areas studied concerning wildlife and wildlife management (range 44.6% - 58.2% correct answers). In particular, the visitor's age, hunting orientation, and type of area where the visitor grew up were not related to any of the wildlife or wildlife management topics studied. Additionally, reading the park wildlife brochure also appeared ineffective in significantly enhancing knowledge of the items investigated. Knowledge was, at best, weakly correlated with attitudes toward wildlife and wildlife management.

Food handling and storage by visitors in the backcountry has been a concern of the park and wildland managers for some time. As shown by Hastings and Gilbert (1981), that injuries to visitors are often related to food-seeking behaviour by bears. Storage of food by the backcountry visitors was inadequate due to the fact that only three percent stored their food properly during the summer of 1979 (Yosemite Bear Management in Hastings and Gilbert 1981).

The improper storing of food in the backcountry, of course, was often related to unhappy and sometimes dangerous encounters with bears. "Visitors often appeared to be completely ignorant of food storage technique, including the existence of suspension cables provided by the park service" (Hastings, Gilbert and Turner 1981, page 3). Some visitors believed that their own precautionary methods (e.g., submerging food in a nearby stream) were superior to those recommended by the park service. Results were often disastrous for the park visitors.

One option available to the park manager is better enforcement of the food storage regulations. However, as Cella and Keay (1980) pointed out, the enforcement of the food regulations has real management implications, when 92 percent of the backcountry visitors stated that they did store their food properly, while in fact only three percent actually had stored their food adequately. This whole matter of appropriate precautions indicates a general lack of knowledge by the visitors to bear occupied habitats (Hastings and Hammit 1986).

Several studies have examined the relationships between knowledge of animals and selected sociodemographic characteristics of the visitors. Concerning the visitor's history of hunting, the literature suggested a wide range of views. Bacon (1974), Dahlgren *et al.* (1977) and Pomerantz (1977) generally found hunters to be more knowledgeable about wildlife than individuals that do not hunt. Kellert (1980b) indicated that, as a group, anti-hunters displayed one of the lowest knowledge scores of any wildlife-related group. Pomerantz's (1977) hunting visitors also scored higher on knowledge than non-hunters; however, these non-hunters were better informed than anti-hunters.

LaHart and Barnes (1978) and Kellert (1985) reported that non-consumptive or appreciative wildlife observers often scored higher and in some cases had higher knowledge scores than the consumptive users. Hastings (1986) reported that hunting status was a poor indicator of specific knowledge about bears.

Attitudes, knowledge, beliefs, behaviour, values, personality factors and demographics are all relevant to the study of perception. However, the relative importance and the manner in which they interact is still unclear (LaHart 1978). Some authors treat many of the above variables as types of perceptions, while others treat them as separate, but influential factors (Hastings 1986).

Mihalic (1974) recommended that we must find out what effects various kinds of bear knowledge (biological, social, and ecological) have on visitor attitudes and behaviour. Is knowledge about bears a factor at all in the formation of visitor behaviour or attitude? The relationship between bear knowledge and exposure to the various sources of information on bears must be examined. If there is a relationship between source, attitude, and behaviour, can these be used as a management tool? Is there a relationship between attitude and future behaviour? If so, which attitude has an effect on which future behaviour? Many of these questions are the subject of the present study and will be examined thoroughly.

4. STUDY METHODOLOGY

4.1 Purpose of the Study

This study was undertaken to examine the level of biological bear knowledge, perceptions, attitudes, and management preferences that park visitors had toward bears in Waterton Lakes National Park, and to suggest what implications these might have toward current bear management practices. Facets of the study attempted to describe the visitor's previous animal-related activities and past experiences with interpretive messages and the effect of these two factors combined on the visitor's level of knowledge and/or attitudes about bears.

In addition, the background of the visitor and selected socio-demographic characteristics were investigated as possible factors affecting knowledge and attitudes. The above relationships were investigated separately and across selected variables.

The study of these issues and interrelationships is of value not only for preserving bears, but more importantly for developing basic strategies in managing visitor behaviour and ensuring visitor safety. If attitudes and knowledge are related to visitor behaviour and bear management preferences, all of which are in the realm of management, one must know more about the attitude, knowledge, and behaviour relationships. As a result of studying these relationships the park manager will be better able to make visitor management decisions and to incorporate the human dimension more effectively with biological considerations. Just as improved biological and behavioural studies of bears have enabled the manager to make better management decisions, much the same can be accomplished by understanding visitor's attitudes and behaviour.

4.2 Objectives of the Study

Objective 1: To measure and determine the status of the visitor's current knowledge concerning the biology of bears.

Objective 2: To identify and isolate the visitor's previous animal-related experiences.

Objective 3: To identify and isolate by means of personal interview the attitudes and perceptions of park visitors regarding bears in Waterton Lakes National Park, Canada.

Objective 4: To determine which socio-demographic characteristics have a significant effect on: first, the stated value for bears; second, the priority for the use of a valley in the park; third, willingness to take precautions to avoid encounters with bears and fourth, the level of biological knowledge concerning bears.

Objective 5: To suggest ways in which the resulting data can be incorporated into improved bear management strategies that will enhance both bear preservation and the visitor's safety.

4.3 Statement of Propositions

Four study propositions were developed to specifically address the range of specific relationships and questions addressed in this study. The nature of the relationship between the independent and dependent variables were formulated as propositions in order to define clear and specific answers to the study objectives.

Proposition 1: The visitor's socio-demographic characteristics will not significantly effect the stated values for bears.

Proposition 2: The visitor's socio-demographic characteristics will not significantly effect the stated priorities for the use of a valley in the park.

Proposition 3: The visitor's socio-demographic characteristics will not significantly effect the stated willingness to take precautions to avoid unwanted encounters with bears.

Proposition 4: The visitor's socio-demographic characteristics will not significantly effect the level of biological knowledge about bears.

In each of the four propositions, there were eleven socio-demographic characteristics selected for testing. Specifically, these were: 1) knowledge of bear biology; 2) history of working with wildlife; 3) current possession of hunting, fishing, or trapping licenses; 4) past possession of hunting, fishing or hunting licenses; 5) source of information on bears; 6) age; 7) sex; 8) level of education; 9) size of current home area; 10) location in park at time of interview, and 11) type of park user.

With an analysis of the previously stated four study propositions, this study describes the attitudes, behaviour, and preferences of the visitors regarding bears, and relevant relationships within and between certain key variables. Additional information has been described to form an assessment of these tested propositions which help park managers to ensure the future of bears by identifying information and relationships that form a basis for future visitor management decisions.

4.4 Design of the Instrument and Sampling Procedure

There were a number of steps used to construct the final interview questions. In all, eight major steps were taken prior to the actual collection of the data.

1. An extensive literature search was conducted using university and national park libraries, personal contact, and the computerized Bear Bibliography containing 5600 citations from the Alaska Cooperative Park Studies Unit. From these sources, selected articles were reviewed concerning the 's knowledge and attitudes regarding bears.
2. Rank in importance the issues and their associated variables that would lead to an understanding of the problems under investigation.
3. There were several meetings held with Waterton Lakes National Park staff regarding the study and methodology for the collection of data.
4. A final series of issues were prepared that would need addressing if the propositions were to be examined thoroughly.
5. The actual interview questions were prepared, and were divided into five areas: knowledge (general and specific issues), attitude (general and specific feelings), animal-related activity (types and quantity), experience with interpretive messages, and socio-demographic characteristics. Within these five areas, interview questions were

completed and approved by all involved.

6. The pretest of the questions. The pretest of the interview questions was conducted on June 12, 13, and 14, 1981 at Waterton Lakes townsite. Nineteen interviews were started, with eighteen being completed. Every visitor that was approached and asked to participate in the interview agreed, and the average length of these pretest interviews was eight minutes. A tape recorder was used to record the visitor's response to the questions. The recorder was out of sight in a daypack. A remote mike was used to record the interview as well as start and stop the equipment. No one objected to having their interview recorded.
7. As a result of the pretest, one question was revised and two additional questions were added to the interview concerning what the visitor's management preferences were in a situation where a bear had been relocated and it kept on coming back to a particular location. The second question added was the visitor's management preference where a decision had to be made concerning the priority for the use of a valley, between bears and humans. All questions were understood by the public, and they responded with an answer related to the topic.
8. In all, there were 31 questions used during the 1981 field season. After the 1981 field season a further review of the questions was conducted, and three new questions were added to the interviews for 1982 field season. These new questions concerned visitor's attendance at other national parks, which national parks were visited, and if the visitor felt they would answer the questions any differently in these other national parks.

4.5 The Interview Instrument

The final interview instrument contained the following thirty-four questions.

INTERVIEW SURVEY - WATERTON LAKES, NATIONAL PARK 1981-82

1. What animals in the park, if any, do you consider dangerous?
2. What is the diet of black bears?
3. What is the diet of grizzly bears?
4. Speed of adult bears?

5. Weight of newborn?
6. How do you distinguish between black and grizzly bears?
7. Average weight of adult black bear in Waterton Lakes National Park area?
8. Average weight of adult grizzly bear in Waterton Lakes National Park area?
9. In your opinion of what value is a grizzly bear?
10. What do you like the least about bears in the park?
11. What do you like the most about bears in the park?
12. How did you learn what you know about bears?
13. What would you do if you encountered a bear at close range?
14. What would you do if you encountered a bear at a distance?
15. What types of bear behaviour do you consider troublesome?
16. What should the park staff do with the troublesome bears?
17. What should the park staff do if the troublesome bears keep coming back?
18. Why do you think people are injured by bears?
19. If a decision had to be made concerning the use of a valley in the park, who should have first priority, bears or people?
20. Did you make any inquiries or take any precautions regarding bears before or upon entering the park?
21. Do you work closely with wildlife or other animals?
22. Do you possess a hunting licence, fishing licence, trapping licence?
23. Have you ever possessed a hunting, fishing, or trapping licence?
24. Is your visit to the park affected by the presence of bears?
25. What was your primary reasons for visiting Waterton Lakes National Park?
26. Where do you live: City, Province or State?
27. What is your present or most recent occupation?
28. Highest year of school completed?
29. Age?
30. Male — Female?
31. Do you visit other national parks?
32. Which other national parks have you visited during the past year?
33. Would you answer any of these questions differently in the other national parks you have visited?
34. If you are staying in the park, are you tenting, using hard-sided vehicles, or in a hotel.

"Thank you very much for your cooperation in answering these questions."

4.6 Study Design

The interview method of collecting data was chosen over other alternative data collection methods for a variety of reasons. Due to the exploratory nature of the study, the interview method was believed to be the most effective in receiving honest, open response from the visitors to a variety of questions. Personal interviews provided the greatest flexibility in gathering data because it allowed the interviewer to probe for further information by asking additional questions for clarification. Questioning visitors while they were in the park provided for the examination of the issues under study in an environment that had wild free-ranging animals, including bears. Also, by interviewing in the park, the problem of requiring visitors to rely on their memories was avoided.

For the purpose of this study, a visitor was considered any person in the park over the age of twelve and not in park uniform. Visitors did includ park employees that were in the park during their days off.

4.7 Knowledge Value of the Visitor's Answers to the Bear Knowledge Questions

In order to evaluate the answers given by the visitors to the seven questions about the biology of bears, each answer was assigned a numerical value of 1 through 5. Each of the numerical values were assigned according to the following format:

knowledge value 1.	This value was assigned to an answer that was incorrect and showed no relevant knowledge about the question.
knowledge value 2.	This value was assigned to an answer that showed some knowledge but was still very limited knowledge.
knowledge value 3.	This value was assigned to an answer that contained some correct knowledge but still lacked specific knowledge.
knowledge value 4.	This value was assigned to an answer with correct knowledge but not specific knowledge.
knowledge value 5.	This value was assigned to an answer with specific correct knowledge; the answer was correct in detail and context.

In assigning numerical value scores to the responses given to questions on diet and distinguishing characteristics between the two species, the following format was used:

knowledge value	Score of 1:	No correct information	= 0 correct answers
knowledge value	Score of 2:	Very limited knowledge	= 1 correct answers
knowledge value	Score of 3:	Some correct knowledge	= 2 correct answers
knowledge value	Score of 4:	Correct knowledge, but limited	= 3 correct answers
knowledge value	Score of 5:	High specific knowledge	= 4 correct answers

For example: If a reply to the question, "What is the diet of a black bear?" was berries and plants, the knowledge value score would be 3. In this example the visitor identified two correct items, i.e., berries and plants in the diet of a black bear.

For the other life history questions (i.e., speed, weight at birth, and adult weight), the answers were assigned a knowledge value score that reflected the level of correct knowledge about the biology of bears.

4.8 Description of Study Area

Waterton Lakes National Park is located in the southwestern corner of Alberta along the eastern slopes of the Rocky Mountains. The park is bordered on the west by British Columbia and on the south by Glacier National Park, U.S.A. (Figure 7). The Park encompasses 525 square kilometers extending 22 kilometers north of the United States-Canada border and 30 kilometers east and west at the widest point. The topography varies from gently rolling prairies to rugged mountain peaks. The elevations range from 1400 meters, where the Waterton River leaves the Park, to 2900 meters at the summit of Blackiston Mountain. There are abrupt changes in topography as a result of major geological faulting and the Lewis Overthrust, which occurred 40 to 60 million years ago. This overthrusting, faulting, and subsequent glacial activity has resulted in the dominant landscape features of cirques, tarns, U- and V-shaped valleys, hanging valleys, waterfalls, mineral deposits, and glacial out-wash areas. All of the rivers in the park are tributaries of the Saskatchewan River system.

The climate of the area may be regarded as "variable mountain climate," although there are still strong continental influences of severe winters and short summers. Both the cold winters and short summers are due in part to the latitude (49° North) and the previously mentioned elevations. The other major climatic factor to be considered is the massive and frequent easterly movement of Pacific air. These chinook winds, mild Pacific air descending on the front ranges of the Rocky Mountains, will often moderate the colder arctic air masses. It is not uncommon for these chinook winds to raise the air temperature 20°C in a matter of an hour or two.

Thus, the park with the wide elevational changes of the prairie-cordilleran transition, along with the continental climates moderated by the chinook winds, provides a vefy broad range of ecological habitats. Over 860 vascular plant species representing over 50 percent of the known

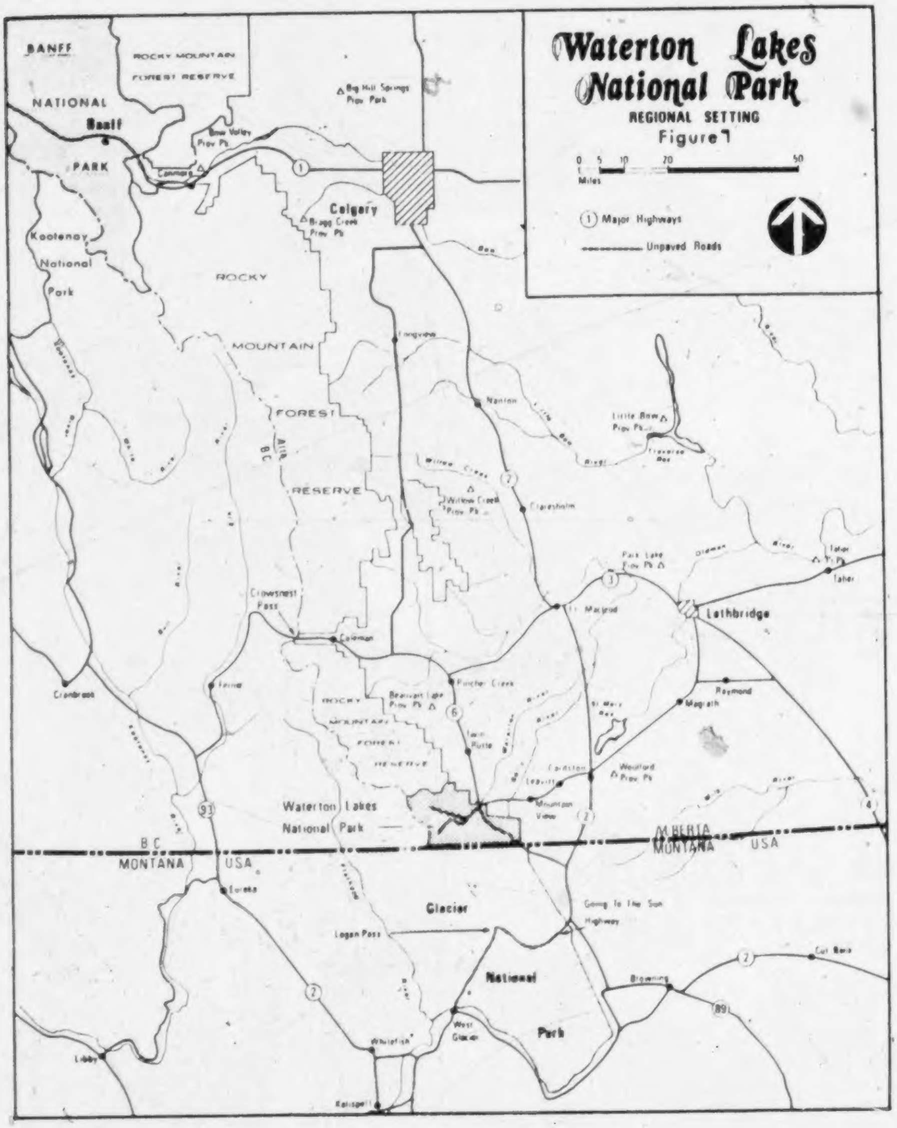

Figure 7: Study Area

flora of Alberta, have been recorded in the park. Sixty-one mammalian species, including five of hypothetical occurrence and 241 avian faunal species have been reported for the park. These mammalian and avian fauna represent nearly 70 percent and 79 percent, respectively, of the known species in Alberta.

Some of the large mammals include elk (*Cervis elaphus*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), whitetail deer (*Odocoileus virginianus*), Rocky Mountain bighorn sheep (*Ovis canadensis*), mountain goats (*Oreamnos americanus*), black bear (*Ursus americanus*), and grizzly bear (*Ursus arctos*).

Access to Waterton Lakes National Park is provided by three provincial highways; No. 5 from Cardston, No. 6 from Pincher Creek, and No. 17 from Montana via the Chief Mountain border crossing. There are a few visitors who may hike along the Upper Waterton Lakes lakeshore, or ride on the boat concession into the park from the southern end of Upper Waterton Lakes, which is in U.S.A. All three of the highways join together near the main entrance gate (Figure 7) and from that point on, there is one main highway seven kilometers long which leads into the townsite in the park. No area of the park is more than ten trail kilometers from a highway.

The major developments in the park are associated with these highway facilities. The Waterton Lakes townsite, with a campground, swimming pool, summer cottages, commercial establishments, and marine concessions, was by far the most heavily used area of the park. Auto access campgrounds are located in the townsite and at Crandell Mountain and Belly River. There are several major trail systems providing access to numerous campsites and major back-country areas of the park. The variety of facilities in the back country varies with camping locations from no or very limited facilities to areas with shelters, horse corrals, and toilet facilities.

4.9 Study Population

Thorsell (1967) conducted a survey which was designed to obtain a general insight into the park's visiting population. The survey suggested that the typical Waterton Lakes National Park camping group consisted of 2.3 adults and 1.3 children; of U.S.A. origin in 62 percent of the cases; on a vacation trip; visiting the park for the first time; stayed an average of 2.6 days in the park; 54 percent visited during weekend or holidays; used a tent or travel trailer for accommodation; stayed in the townsite campground 6.5 percent of the time; and "sightseeing" was given as the major purpose for visiting Waterton Lakes National Park.

The motel-hotel visitors accounted for one-fifth of the total park population had the following characteristics: a typical group had 2.4 adults with 0.8 children; 73 percent were of U.S.A. origin; entered the park from the south 64 percent of the time; on major vacation trips; stayed 1.8 days; were also visiting the park for the first time; 57 percent visited the park on a weekend or holiday; had a 76 percent chance of visiting Glacier National Park; and sightseeing was also given as the primary reason for visiting the park.

The day-visitor accounted for 46 percent of the total park visitation. The day-oriented group characteristics were: consisted of 2.2 adults with 1.5 children; almost equally divided between Albertans and out of province; remained in the park only 4.5 hours; viewed Waterton Lakes National Park as a destination; did not visit Glacier National Park; reported to have visited the park before, visitation was evenly divided between weekend, holidays and weekdays; and sightseeing was given as the primary reason for visiting the park.

Visitors from the U.S.A. accounted for 54.4 percent in 1965 as compared to 51.5 percent in 1961. It was apparent that the local population were using Waterton Lakes National Park as a regional recreation area and only incidentally as a major vacation spot, while non locals used the park as a major stopping location.

The length of stay statistics clearly show that most people (89 percent) had spent less than three days in the park and 70 percent of the day-users (which accounted for 46 percent of total visitation) had stayed less than six hours. This was a dramatic change from 1961 when the visitors had reported average length of stay as 5.5 days.

Another important finding by Thorsell (1967) was that 58 percent of the visitors to Waterton Lakes National Park indicated they were going to, or have visited, Glacier National Park, U.S.A.. There were strongly related visitor patterns between these two parks, when disregarding the day-user, with 70 percent of the Waterton Lakes National Park visitors planning to visit or having visited Glacier National Park, U.S.A.

4.10 The Interview Sites

There was a need to choose a representative sample from all the types of visitors to the park. With this goal in mind, there were five areas from which the visitors were randomly chosen.

1. **Cameron Lake Trail Head and Trail.** This area is in the extreme southwest corner of the park, in a high subalpine valley where Cameron Lake is located. Access is via an internal park road called the Akamina Highway. The valley is a favorite day-use area for sightseeing, hiking, and canoeing on Cameron Lake. From the parking lot, there are two major trails, one of which goes down the west side of Cameron Lake some 1.5 km and ends near the Canadian-U.S.A. boundary.
2. **Crandell Campground.** This campground is located centrally in the park in the Blackiston Valley. The area is used primarily in the summertime by tent campers, pickup and motorhome camping units. There are 10 major camping loops, each containing several camping sites. The area is in the valley bottom in a 50- to 100-year-old lodgepole pine stand.
3. **Bertha Lake and Crypt Lake Trails.** In the park, there are over 150 miles of developed hiking trails. Within this study, two trails were selected as interview sites. They were Bertha Lake Trail, which starts from the southwest corner of the townsite and extends 5 km to Bertha Lake, and the Crypt Lake Trail which is to the southeast of the townsite across Upper Waterton Lake. Access to the latter trail is via a boat or ferry service from

the townsite. The trail is 5 km long and eventually ends at Crypt Lake, which is in an alpine cirque.

4. **Campground, Waterton Townsite.** This campground is in the southern half of the townsite. It is used by tenters, pickup trucks with campers, and different types of motorhomes. This campground receives extensive use in the summertime and is the only camping area open from early May to late October. From this campground, it is a 3-5 minute walk to most locations in the townsite.
5. **Information Centre.** The Information Centre is located along the main park entrance road just before the townsite. It serves a variety of functions, such as selling fishing permits, distributing pamphlets, and giving weather and hiking information. Approximately 40,000 people per year visit the Information Centre.

4.11 Data Collection

Data were collected from 370 interview subjects. Interviews were conducted by the researcher, who was identified to the visitor by a name tag that also had the name of the university. No uniform was worn. Interviews were conducted during August and September, 1981, and during May, June, July, and August, 1982. During 1981, a total of 105 interviews were completed while the remaining 265 interviews occurred during 1982. Interviewing times were from 10:00 a.m. to 10:00 p.m. The average interview length was 11 minutes, with some interviews lasting 15-20 minutes.

When interviews were conducted in the townsite and Crandell Mountain campgrounds, a table of random numbers was initially used to determine which loops and sites would be selected. For example; if the first number selected from the table of random numbers was even, then even-numbered loops and sites were selected and interviews were attempted. If the next number was odd, then the odd-numbered sites were chosen and the interviews were undertaken. There was a further attempt to randomize the interviews between males and females when couples were encountered.

For the Information Bureau, Bertha Lake and Crypt Lake Trails, and the Cameron Lake Trail, the interviewer used a table of random numbers to determine which visitor would be selected. The interviewer would let the visitors pass by until the random number was reached. Then the interviewer would stop the potential visitor, introduce himself and request that they participate in a study about the park. It was explained that their name was not required. The purpose and goals of the study were not explained to the visitor, if they asked, until after the interview was completed.

The actual interview process consisted of 34 questions lasting 10-15 minutes with the visitor's answers recorded into a cassette recorder. The visitors were informed that their answers were being recorded for ease of analysis. The cassette recorder was in a day pack, out of sight, with the microphone held in the interviewer's hand. For convenience of the researcher, the microphone had an on-off switch that was used to activate the recorder. If the interview occurred at a picnic table, the day pack, containing the cassette recorder, was placed on the table with the microphone held by the interviewer. Normally the researcher was wearing the day pack containing the cassette recorder when the interviews occured on a trail or similar area, The microphone which activated the recorder was held by the researcher.

4.12 Limitations and Possible Sources of Error

There were four major types of errors that were taken into account, they were: reactive measurement, sampling errors, errors of content, and errors of operation. Reactive measurement error occurs because the visitors may have reacted to being studied. The possible range of reactive errors include: visitor feeling they were being examined, visitor adapts a role they think was wanted, visitors changing answers as a result of preamble and questions, visitor developing a set or pattern in identifying answers, researcher inconsistencies over time and with the visitors, and the researcher's effects on the subject (i.e., Hawthorne effect). Several techniques were used to avoid reaction errors. These included guaranteeing the confidentiality of the visitors so they were under no social obligation to out perform anyone else. By strictly limiting the length of preamble and social interactions prior to the interview, the visitors were under no obligation to select a particular role model. Also, the visitor could not initially determine the objectives of the study. Interviewing methodology eliminated a pattern of possible answers. Therefore, each visitor was prevented from developing series or patterns with their answers. Consistency was maintained by using a common approach and giving the interview questions in the same sequence.

Sampling error involves the inability to obtain a wholly representative selection of subjects. The range of sampling error includes restricting the population, population instability over time, and population instability over space. Due to the nature of the questions being asked, no one under the age of twelve was asked to participate, an age which is four years younger than other attitudinal studies. The instability of the population over time was not a problem. The instability of the population over space was taken into consideration. That was why five interview locations were selected.

Error of content is caused by using a data collection technique not appropriate for the kind of data required. The interview method was selected specifically to guard against errors of content. Since this study was to examine the attitude, knowledge, and preference of the visitors regarding bears, it was necessary to be able to explore the visitor's personal feelings about many issues.

Error of operation refers to the restrictions on the research. The range of operation errors include collecting irrelevant data, external and internal validity checks, and concerns whether or not the study can be replicated. By carefully reviewing the related research, establishing study objectives, developing and pretesting the questions, very little irrelevant data was collected. There were several questions that had internal validity checks by asking two or more related questions on the same issue when validity was thought to be a potential problem. No systematic external validity checks were built into the study. The study can be easily replicated for the purpose of longitudinal analysis or can be easily transferred to another location for the purpose of comparative analysis.

One possible error of operation was a small problem involving study visitors discussing the study questions and possible answers with other park visitors. Because the study involved a subject, bears, that was of unusual interest; it was found that on occasion some visitors had regularly engaged other visitors in discussions about bears, When discovered a one or two-day period would lapse prior to re-entering the area for interviews. If the visitor indicated they had discussed the interview questions with previous study visitors, the interview was either terminated or not included in the study sample.

4.13 Data Analysis

Since there are few actual studies of visitors' knowledge and attitudes concerning black and grizzly bears comparative reviews were difficult, an effort was made to increase the sample size to aid in the reliability of the present study. These data reflect those interviewed. The number of visitors to Waterton Lakes National Park was over 650,000 in 1981 and 660,000 in 1982. How many of these visitors were "first time" visitors and how many were repeat visitors is not known. In any event, the universe from which the 370 study visitors were drawn may be 750,000+ visitors.

Sampling bias is always possible when a portion of a population is sampled and measured. The sample portion may not always mirror the population. Thus the sampling error depends on the size of the sample and equals one minus the square root of one divided by the sample size. When n = 370, sampling error was calculated to be 0.051 which allows for a 94.9 percent confidence level in a sample of this size.

Data were analyzed using the Minitab Statistical package, developed by Pennsylvania State University, 1985 edition. This package was used to generate the descriptive statistics, as well as to carry out the contingency and one-way analysis tests.

Descriptive statistics were used to organize the data presented as frequency distributions. The contingency (chi-square test in a table format) tests were used to examine the relationship or independence between selected variables. The one-way analysis of variance tests were used to analyze the total knowledge value score by the levels within a selected variable.

5. RESULTS, DATA ANALYSIS, AND PRESENTATION

5.1 Socio-demographic Characteristics of the Visitors

5.1.1 Education

The visitor's responses when asked the "number of years of education completed" are shown in Table 3. The largest group were those completing Grades 10, 11, and 12. All educational levels were represented, with a substantial number of the visitors (27.6 percent) having completed college degrees at the bachelor, masters, or doctorate levels. This compares favorably with the Mihalic (1974) study in adjacent Glacier National Park, U.S.A.

5.1.2 Age

The age distribution is given in Table 3. The mean age for the visitors was 30.2 years. The two largest groups were the 18–24- and the 25–34-year-old persons. These two groups accounted for 62.1 percent of the visitors which is in agreement with Mihalic (1974). In his study the 16–25 and 26–35-year-old visitors accounted for 27.85 and 25.95 percent, respectively, for a total of 63.8 percent. The 65-and-older group may be under-represented because no tour or charter buses were stopped and included in the sampling procedures.

5.1.3 Sex of Visitors

Male visitors comprised the major portion of the sample (Table 3) totaling 236 (63.7 percent); while there were 134 (36.3 percent) females. This is in agreement with the Mihalic (1974) study where there were 63.9 percent males and 36.1 percent females at Logan's Pass in Glacier National Park, U.S.A.

Table 3. Socioeconomic Characteristics of Visitors in Waterton Lakes National Park, Canada, 1981-82.

Socioeconomic/Demographic Characteristics	Number of Visitors	Percent of Visitors
Education		
Jr. High	15	4.0
High School	149	40.3
Some College	72	19.5
Technical/Voc. School	32	8.6
College 4 years	67	18.1
Graduate Degree	35	9.5
Total	370	100.0
Sex		
Male	236	63.7
Female	134	36.3
Total	370	100.0
Age		
12-17	11	3.0
18-24	114	30.8
25-34	118	31.9
35-44	38	10.3
45-54	27	7.3
55-64	37	10.0
65+	25	6.7
Total	370	100.0

5.1.4 Occupations of Visitors

The visitor's occupations are presented in Table 4. The occupational categories used were the Standard Occupational Classifications as listed by Statistics Canada, Standards Division. The occupations of the visitors were varied and well distributed.

Almost every standard occupational category listed by Statistics Canada was represented. No one single occupational category dominated. The most common categories (students, housewives, and science and engineering) collectively accounted for 116 visitors (31.4 percent) of the total sample. The remaining 254 visitors (68.6 percent) were distributed among the other 18 occupations.

5.1.5 Origin of the Visitors

The origin of the visitors is presented in Table 5. By far, the largest group was from Alberta, 196 (53.0 percent) of the visitors. This high percentage of visitors from Alberta is in sharp contrast with Thorsell (1967) where only 28 percent of the visitors to the Waterton Lakes National Park were from Alberta. The other major contrast was the percentage of visitors from the United States. Thorsell (1967) reported 54.4 percent of the visitors were from the United States, whereas in the present study, 20.8 percent of the study visitors were from the United States.

The towns in Alberta that had the greatest number of visitors is shown in Table 6. More than two-thirds of the visitors from Alberta had come from the largest cities in the province.

The size of the visitor's current home area is shown in Table 7. The single largest category of the visitors were from cities of 500,000 to 1 million. Of the 119 (32.2 percent) visitors in this category, 73 (19.7 percent) were from either Calgary or Edmonton. The relatively few (19) visitors in the 100,000-500,000 range was not totally unexpected considering there are very few cities in Alberta or within several hundred kilometers of Waterton Lakes National Park that have populations of this size.

Table 4. The Occupational Classifications of Visitors.

Occupation	Number	Percent
Student	40	10.8
Housewife	38	10.3
Science & Engineering	38	10.3
Clerical	30	8.1
Managerial	28	7.6
Medicine	27	7.3
Construction	21	5.7
Retired	18	4.9
Sales	16	4.3
Service	15	4.1
Fabricating	15	4.1
Forestry	14	3.8
Farming	13	3.5
Teaching	12	3.2
Mining	8	2.2
Social Sciences	7	1.9
Transportation	7	1.9
Unemployed	6	1.6
Food Processing	5	1.4
Artistic	4	1.0
Processing	4	1.0
Machine	4	1.0
TOTAL	370	100.0

Table 5. Origin of the Visitors Using Waterton Lakes National Park

Origin of Visitors	Number	Percent
Canada		
Alberta	196	53.0
British Columbia	23	6.2
Saskatchewan	13	3.5
Manitoba	20	5.4
Ontario	18	4.8
Quebec	3	0.8
West Germany	5	1.3
Denmark	1	3
Great Britain	6	1.6
Holland	3	0.8
Scotland	3	0.8
Switzerland	2	0.5
Western United States	43	11.6
Eastern United States	34	9.2
TOTAL	370	100.00

Table 6. Origin of Visitors from Alberta Visiting Waterton Lakes National Park

Location of Visitor's Current Home Area	Number	Percent
Calgary	77	39.6
Lethbridge	45	23.0
Edmonton	21	10.7
Pincher Creek	10	5.1
All Other Albertans[1]	43	21.9
TOTAL	196	100.0

[1] There were 23 Alberta origins that were combined to form the "All Other Albertans" grouping. All the other origins had less than four visitors per location.

Table 7. Population Size of the Visitor's Current Home Area

Population Size of Current Home Area	Number	Percent
Unknown	12	3.2
0 - 1,000	11	3.0
1,001 - 5,000	20	5.4
5,001 - 20,000	48	12.9
20,001 - 50,000	47	12.8
50,001 - 100,000	58	15.5
100,001 - 500,000	19	5.1
500,001 - 1 million	119	32.1
1 million +	37	10.0
TOTAL	370	100.0

The location of the visitors at the time of the interview is shown in Table 8. The majority of interviews (64.8 percent) were conducted in the park's campgrounds.

5.1.6 Type of Visitors

The visitors were categorized according to the type of user (Table 9). The majority of the study sample were overnight campers (81.9 percent) while 18.1 percent were day users.

5.1.7 Visitor's Use of Other National Parks

The visitors's answers to the question "Do you visit other national parks?" are shown in Table 10. It was very interesting to see that 97 percent of the visitors indicated that they did visit other national parks. The visitors were then asked "which other national, provincial/state parks did you visit during the past year?" (Table 11). A large percentage of the visitors visited other national parks on a regular basis. Over 80 percent of those parks most often visited have both black bear and grizzly bear populations.

The visitors were asked if they would answer any of the questions differently if the interview had occurred in another park. The responses to this question is shown in Table 12. Based on the responses as shown in Table 12, there was no reason to feel that these visitors would answer questions any differently in the other parks that were visited during the past year.

5.1.8 Reasons For Visiting The Park

The visitor's primary reasons for going to the park ranged from escapism to specific reasons. Table 13 indicates the answers received when asked, "What is your primary reason for visiting Waterton Lakes National Park?" An attempt was made to have the visitors clearly specify their primary reason for going to the park in an effort to narrow this reply to a singular response.

Table 8. Visitor's Location in the Park at the Time of the Interview

Park Locations	Number	Percent
Waterton Campground	137	37.1
Crandell Campground	103	27.8
Cameron Trail	50	13.5
Trails	43	11.6
Information Centre	37	10.0
TOTAL	370	100.0

Table 9. Classification of Study Population According to Accomodation.

Type of Visitor	Number	Percent
Overnight, tent[1]	158	42.7
Overnight, hard-sided vehicle and hotel guests	145	39.2
Day visitors	67	18.1
TOTAL	370	100.0

[1] Tent users included visitors using tent trailers and vans with pop-up tent tops.

Table 10. Visitor's Use of Other National Parks

Visit other Parks	Number	Percent
Yes	290	97.0
No	9	3.0
Unknown[1]	71	-
TOTAL	370	100.0

[1]This question was added after the 1981 interviews but prior to the 1982 interviews.

Table 11. Other National Parks Visited During the Preceeding Year

Parks Visited	Number[1]	Number[2]	Number[3]	Total	Percent[5]
Banff	178	29	2	209	79.5
Jasper	18	125	27	170	64.6
Glacier (US)	68	14	13	95	36.1
Yoho	2	4	18	24	9.1
Yellowstone	1	13	8	22	8.3
Yosemite	4	4	4	12	4.6
Provincial/State	6	1		7	2.7
Other National Parks	2	3	4	9	2.4
Unknown[4]	91	177	294		

1. This column represents the visitor's 1st reply.
2. This column represents the visitor's 2nd reply.
3. This column represents the visitor's 3rd reply.
4. This question was not asked during the 1981 interviews but was included for the last 263 interviews.
5. This percent figure is calculated on the basis of 263 visitors responding to the question.

Table 12. Would Visitors Answer Any Differently in Other National Parks?

Answers	Number	Percent
Yes	2	.8
No	261	99.2
Unknown[1]	107	-
TOTAL	370	100.0

[1] This question was not asked during the first 105 interviews, but was asked during the last 265 interviews. The percentages are calculated out of 265 interviews.

Table 13. Primary Reason for Visiting Waterton Lakes National Park

Reason for Visit	Number	Percent	Cumulative Percent
Sightseeing	87	23.5	23.5
Holiday	87	23.5	47.0
Enjoy Natural Beauty	40	10.8	67.3
Days hiking	35	9.5	57.8
Camping	33	8.9	76.2
Viewing Wildlife	24	6.5	82.7
Backpacking	16	4.3	87.0
Recreation	15	4.0	91.0
Fishing	12	3.2	94.2
Get Away From City	11	3.0	97.2
Horseback Riding	3	0.8	98.0
Diving	3	0.8	98.8
Sports, Tennis, Golf	2	0.5	99.4
Job Hunting	1	0.3	99.7
Unknown	1	0.3	100.0
TOTAL	370	100.0	

5.2 Visitor's Level of Biological Bear Knowledge

The first major objective of the study was to measure and determine the status of the visitor's current knowledge concerning the biology of bears.

The following is a description of the responses received to the seven life history questions concerning bears. For the present study seven life history questions were used: diet of black bears, diet of grizzly bears, running speed of adult bears, weight of newborn, distinguishing characteristics between the two species, and average adult weights for black bears and grizzly bears.

5.2.1 Diet of Bears

Table 14 shows the visitor's responses to the question, "What is the diet of black bears?" The general trend was to believe the diet of black bears consisted of berries, plants, small animals, and roots.

Table 15 shows the visitor's responses to the question, "What is the diet of grizzly bears?" The general trend was to believe the diet of grizzly bears consisted of animals, including carrion and fish.

Table 16 compares the percent of visitors that included a particular item in either the diet of black or grizzly bears. It was interesting to note that the visitor's beliefs about the diet of grizzly bears included less berries, plants, and roots, and that the grizzly bear was less of an omnivore. Correspondingly they believed that the diet of the grizzly bear included more fish, small animals, carrion, and large animals. There was a marked difference in the visitor's perceptions concerning the diets of the two species. Clearly, visitors believed the diet of the black bear to be vegetarian while the grizzlies were viewed as flesh eaters.

5.2.2 Speed of Bears

The running speed of the adult bears was another topic used to determine the visitor's biological bear knowledge. Table 17 shows the responses to the question, "What is the speed of

Table 14. Visitor's Perceptions Concerning the Diet of Black Bears.

Diet Items	Number[1]	Number[2]	Number[3]	Number[4]	Total Number[5]	Percent[6]
Berries	244	55	13	2	314	84.8
Plants	47	110	16	6	179	48.4
Small Animals	18	52	34	2	106	28.6
Roots	11	42	30	1	84	22.7
Garbage	9	30	12	-	51	13.8
Fish	8	22	10	4	44	11.9
Omnivore	18	3	9	3	33	8.9
Carrion	5	6	6	3	20	5.4
Honey	2	2	3	2	9	2.4
Unknown	8	48	237	347	-	-
TOTALS	370	370	370	370		

[1] This column gives the visitor's 1st reply to the question.
[2] This column gives the visitor's 2nd reply to the question.
[3] This column gives the visitor's 3rd reply to the question.
[4] This column gives the visitor's 4th reply to the question.
[5] This column reflects the number of visitors that included this material in the bear's diet.
[6] This column reflects the percent of visitors that included this material in the bear's diet.

Table 15. Visitor's Perceptions Concerning the Diet of Grizzly Bears

Diet Items	Number[1]	Number[2]	Number[3]	Number[4]	Total Number[5]	Percent[6]
Small Animals	90	40	19	2	151	40.8
Berries	66	39	26	4	135	36.5
Fish	44	35	24	5	108	29.2
Plants	45	32	17	3	97	26.2
Large Animals	11	56	11	3	81	21.9
Carrion	20	22	34	3	79	21.3
Same as Black Bears	50	5	2	3	62	16.7
Roots	6	35	12	-	53	14.3
Garbage	11	7	-	-	18	4.9
Omnivore	8	-	-	-	8	2.1
Unknown	19	99	225	347	-	-
TOTALS	370	370	370	370		

[1] This column gives the visitor's 1st reply to the question.
[2] This column gives the visitor's 2nd reply to the question.
[3] This column gives the visitor's 3rd reply to the question.
[4] This column gives the visitor's 4th reply to the question.
[5] This column reflects the number of visitors that included this material in the grizzly bear's diet.
[6] This column reflects the percent of visitors that included this material in the grizzly bear's diet.

Table 16.Comparison of the Visitor's Perceptions of the Diets of Grizzlies and Black Bears, (percent of visitor indicating diet item)

Diet Items	Black	Grizzly
Berries	84.8	36.5
Plants	48.4	26.2
Small Animals	28.6	40.8
Roots	22.7	14.3
Garbage	13.8	4.9
Fish	11.9	29.2
Omnivore	8.9	2.1
Carrion	5.4	21.3
Same as Black Bears	-	16.7
Honey	2.4	-
Large Animals	-	21.9

Table 17. Visitor's Perceptions Concerning the Speed of Adult Bears

Speed of Bears		Number	Percent
0-10 mph	0-16 kmph	2	0.5
11-20 mph	17-32 kmph	19	5.1
21-30 mph	33-48 kmph	173	46.8
31-40 mph	49-64 kmph	141	38.1
41+ mph	65 kmph	20	5.4
Don't know		10	2.7
Unknown		5	1.4
TOTAL		370	100.0

adult bears?" The question had no specific reference to either black or grizzly bears. There were less than 19 visitors that specified their answers applied specifically to either grizzly or black bears.

By far the most common belief was that adult bears can outrun or catch a human. There were only six visitors that gave the 0-10 mph answer.

5.2.3 Weight of Cubs

The weight-of-the-newborn-cubs question was asked to help separate those visitors who have actually studied bears from the visitors who may have casually read about bears. All the other biological bear knowledge questions were discussed in the Parks Canada Pamphlet, "You Are In Bear Country" (Parks Canada 1984). Table 18 shows the visitor's responses to the question, "What Is The Weight Of Newborn Cubs?". As in the case with speed of adult bears, there were less than 16 visitors who gave their answers in metric. There were only 60 (16.2 percent) of the visitors that could correctly identify the correct weight of a newborn cub, which is generally less than .5 kg.

There were far more visitors that believed the newborn weight was over 7.0kg than those who gave the correct weight. There seems to be a wide range in the answers evenly distributed across the range. Clearly, most of the visitors were guessing at the weight of a newborn cub.

5.2.4 Distinguishing Between Black and Grizzly Bears

One of the major assumptions often made is that the general public can generally tell the difference in appearance between black and grizzly bears. Distinguishing between black and grizzly bears was one of the topics covered in pamphlets published by Parks Canada, United States Park Service, and the provincial/state agencies. During the summertime, these publications are given to visitors as they entered various parks. Table 19 summarizes the responses to the question, "How do you distinguish between black bears and grizzly bears?"

Table 18. Visitor's Perceptions Concerning the Weight of a New-Born Cub

Weight of	Newborn	Number	Percent
0 - 2.2 lbs	0 - 1 kg	60	16.2
2.3 - 5 lbs	1.1 - 2.3 kg	54	14.6
5.1 - 10 lbs	2.4 - 4.5 kg	46	12.4
10.1 - 15 lbs	4.6 - 6.8 kg	34	9.2
15.1 - 20 lbs	6.9 - 9.0 kg	31	8.4
20.1 - 25 lbs	9.1 - 11.3 kg	15	4.0
25.1 - 30 lbs	11.4 - 13.6 kg	13	3.5
30.1 ± lbs	13.7 + kg	73	19.7
Don't know		31	8.4
Unknown		13	3.5
TOTAL		370	100.0

Table 19. Characteristics Used by Visitors to Distinguish Between Black and Grizzly Bears

Distinguishing Characteristic	Number[1]	Number[2]	Number[3]	Number[4]	Total Number[5]	Percent[6]
Size	92	111	18	1	222	60.0
Color	97	51	17	3	168	45.4
Shoulder hump (grizzly)	74	36	17	-	127	34.2
Hump on back (grizzly)	46	20	11	-	77	20.8
Size of head	10	16	16	2	44	11.9
Claws, foot print	7	13	8	-	28	7.6
Black narrow face	8	4	10	4	26	7.0
Grizzly longer face	6	7	5	3	21	5.6
Body conformation	8	-	-	-	8	2.1
Grizzly can't climb tree	4	1	1	-	6	1.6
Grizzly, high forehead	2	-	-	-	2	0.5
Unknown/Don't know	16	111	267	357	-	-
TOTALS	370	370	370	370		

[1] This column gives the visitor's 1st reply to the question.
[2] This column gives the visitor's 2nd reply to the question.
[3] This column gives the visitor's 3rd reply to the question.
[4] This column gives the visitor's 4th reply to the question.
[5] This column reflects the number of visitors who included this item in their answer.
[6] This column reflects the percent of visitors who included this item in their answer.

The visitor's ability to distinguish between the two species was questionable. Size was given as a distinguishing characteristic 222 (60 percent) times. In 97 cases (26.2 percent) of the time, color was the first distinguishing characteristic indicated. In total, color was mentioned 168 times (45.4 percent) by the visitors. Size and color are considered very poor and unreliable methods to distinguish between the two species. Another similar belief was expressed by 77 visitors (20.8 percent) that the hump was on the back or on the hind quarters of the grizzly bear. There were 111 (30 percent) of the visitors who could not mention a second distinguishing characteristic. In similar fashion, there were 267 (72.1 percent) and 357 (96.5 percent) of the visitors who could not identify a third and fourth distinguishing characteristic, respectively.

5.2.5 Adult Weights of Bears

The final biological bear knowledge questions concerned the adult weights of both species. Adult weight of both species was one of the topics covered in the "bear" pamphlets handed out by both Parks Canada and United States Park Service. Table 20 shows the responses to the question, "What Is The Average Weight Of Adult Black and Adult Grizzly Bears In Waterton Lakes National Park?"

The visitor's perception concerning the relative size of the two bears shows 181 (48.8 percent) of the visitors correctly identified the average adult weight for black bear which was considered to be between 110 kg and 150 kg. The mean weight given by the visitors for adult black bears was 95 kg (280 lbs).

The visitor's biological bear knowledge concerning the grizzly bear was much more diverse with 51 visitors (13.8 percent) considering the average adult weights above 450 kg (1000 lb). There was a tendency for the public to report the largest weights rather than the average adult weights. When this occurred, the researcher restated the question specifically asking for the average adult weights. There were 111 (30.0 percent) who correctly identified the average adult weight of a grizzly bear which was considered to be between 182 kg and 250 kg. The mean weight given by visitors for the adult grizzly bear was 255 kg (560 lbs) which is twice the

Table 20. Visitor's Perceptions Concerning the Adult Weight of Black and Grizzly Bears

Weights	Black		Grizzly	
	Number	Percent	Number	Percent
0 - 91 kg	17	4.6	2	0.5
92 - 181 kg	181	48.9	22	5.9
182 - 272 kg	80	21.6	111	30.0
273 - 363 kg	33	8.9	80	21.6
364 - 454 kg	23	6.2	68	18.3
455 - 545 kg	3	0.8	18	4.9
546 - 636 kg	3	0.8	11	2.9
637 - 727 kg	-	-	6	1.6
727 + kg	-	-	16	4.3
Unknown	30	8.1	36	10.0
TOTAL	370	100.0	370	100.0

average adult weight given for the adult black bears.

It should be noted concerning the diet and adult weight questions, the visitors were asked the same question for both black and grizzly bears (See table 21). In both cases, the visitor's mean biological bear knowledge scores were higher for blacks than grizzlies. An analysis of variance between the mean bear knowledge scores for diets of blacks and grizzlies, yielded an F statistic of 9.33. The corresponding value from an F table, using p=0.05, is about 3.85. Since 9.33 is much larger than 3.85, it indicated that the visitor did have more accurate knowledge about the diets of black bears than grizzly bears.

Concerning the average adult weights of the two species (Table 21), the mean biological bear knowledge scores were 3.55 for blacks with 3.31 for grizzlies. An analysis of variance yielded an F value of 4.21. The corresponding value from an F table, using p=0.05, is about 3.85. The fact that 4.21 is greater than 3.85 does indicate that the visitors were more knowledgeable about average adult black bear weight than average adult grizzly bear weight. There was a tendency to overestimate the average adult weight for grizzlies.

5.2.6 Total Bear Knowledge Scores

As introduced within the methodology chapter, each answer to the biological bear knowledge questions was evaluated with bear knowledge value score assigned. This was done for each answer, and then all the visitor's individual bear knowledge value scores were added together forming a total bear knowledge value score. The total biological bear knowledge value score was intended to form an index which represented the visitor's overall level of knowledge concerning the biology of bears (Table 22 shows the distribution and range for the visitor's total bear knowledge value scores). There were seven knowledge questions with each answer having a possible range of value of 1 through 5. Therefore, the total bear knowledge value scores formed an index which ranged from 7 to 35 inclusive.

As can be seen when considering the individual visitor, there were 2 (0.5 percent) that had no correct bear knowledge. There were 22 (5.4 percent) that had very limited correct

Table 21. Distribution of Knowledge Value Scores by Biological Bear Knowledge Questions

Life History Questions	Knowledge Value Score 1	2	3	4	5	Mean Knowledge Score
Diet of black bear	13	70	165	97	25	3.14
Diet of grizzly bear	30	84	159	70	25	2.92
Weight of black bear	79	5	75	20	184	3.55
Weight of grizzly bear	84	43	31	90	120	3.31
Speed of bear	19	25	105	68	153	3.84
Weight of new born	201	1	49	53	62	2.36
Distinguish black/grizzly	42	122	114	67	22	2.72

Table 22. Distribution of the Visitor's Total Bear Knowledge Value Scores

Groupings	Total Knowledge Value Score	Number of Respondents	Percent
1 Knowledge Value (no correct knowledge)	7	2 (2)	0.5 (0.5)
2 Knowledge Value (very limited knowledge)	8	1	0.3
	10	1	0.3
	11	2	0.5
	12	4	1.1
	13	5	1.4
	14	8 (21)	2.2 (5.8)
3 Knowledge Value (some correct knowledge)	15	10	2.7
	16	17	4.6
	17	24	6.5
	18	27	7.3
	19	28	7.6
	20	33	8.9
	21	20 (159)	5.4 (43.0)
4 Knowledge Value (correct knowledge)	22	35	9.5
	23	21	5.7
	24	24	6.5
	25	27	7.3
	26	12	3.2
	27	19	5.1
	28	8 (146)	2.2 (39.5)
5 Knowledge Value (high specific knowledge)	29	10	2.7
	30	11	3.0
	31	9	2.4
	32	4	1.1
	33	1	0.3
	34	3	0.8
	35	4 (42)	1.1 (11.2)
TOTAL		370	100.0

biological knowledge of bears. At the other end of the knowledge index, there were 42 (11.6 percent) of the visitors that could be considered as having correct and specific knowledge of bears. In general, the visitors weren't very knowledgeable in any of the seven biological areas questioned. The average index score was 52.6 percent correct answers.

5.3 Visitor's Animal-Related Activity Patterns

The second major objective of the study was to identify and isolate the visitor's previous animal-related experiences. There were two major areas of animal-related activities considered: first, whether the visitor had worked with wildlife or domestic animals, including any commercial operation; and second, if the visitor currently possessed, or had ever possessed, a hunting, fishing, or trapping licence.

Table 23 shows the visitor's reply to the question, "Do you work closely with wildlife or other animals?" Included in the "yes" reply were 29 (7.8 percent) of the visitors who had a house pet.

It has been suggested by some researchers (Bacon 1974; Dahlgren *et al*. 1977; Pomerantz 1977; and Kellert 1980a) that park visitors that had hunting or fishing licences were more knowledgeable about animals than visitors who do not engage in these activities. These differences might include higher levels of bear knowledge and different attitude. Table 24 shows the visitor's answers to the question, "Do you now possess a hunting, fishing or trapping licence?" As can be seen by the answers, 249 (67.3 percent) of the visitors at the time of the interview didn't possess any of these licences. There were no visitors that possessed a trapping licence. By far the greatest number of visitors that did possess one of the three licences were fishermen. This was not totally unexpected considering that fishing, not hunting, is allowed in national parks.

The visitors were then asked as a follow-up, "Have you ever possessed a hunting, fishing, or trapping licence?" Table 25 shows the response to this question. Although the question was asked to determine the visitor's background with these outdoor activities, there

Table 23. Familiarity of Working With Wildlife/Animals

Work with Wildlife/Animals	Number	Percent
No	291	78.6
Yes	79	21.4
TOTAL	370	100.0

Table 24. Visitor's Current Possession of Hunting, Fishing, or Trapping Licence(s)

Current Licence Possession	Number	Percent
No trapping	370	100.0
No hunting and fishing	249	67.3
Yes, hunting and fishing	27	7.3
Yes, fishing only	87	23.5
Yes, hunting only	7	0.9

Table 25. Visitor's Past Possession of Hunting, Fishing, Trapping Licences

Past Licence Possession	Number	Percent
No, Trapping	370	100.0
No, Fishing and Hunting	137	37.0
Yes, Fishing and Hunting	77	20.8
Yes, fishing only	142	38.4
Yes, Hunting only	14	3.8

Table 26. Animals Believed to be Dangerous

Animals	Number	Percent
Bears	280	75.7
No Animals	35	9.6
Grizzly bear	21	5.6
Ungulates	17	4.6
People	7	1.9
Predators & Snakes	5	1.3
Unknown	5	1.3
Total	370	100.0

were some unexpected results. First, there were 137 (37.0 percent) of the visitors that have never had any of the three licences. Included in this group were 21 (5.7 percent) of the visitors that not only indicated they have never possessed either of these licences but were totally opposed to hunting; secondly, there were no visitors that had ever possessed a trapping licence.

5.4 Visitor's Attitudes About Bears and Bear Management

The third major objective of the study was to identify the attitudes and perceptions of park visitors regarding bears in Waterton Lakes National Park, Canada. Visitor's attitudes were measured by utilizing a predetermined series of questions or behavioural choices. Three major areas were investigated: the visitor's perception of dangerous animals and actions taken to prevent possible unwanted encounters with bears, including possible reactions to actual encounters with bears; the visitor's perceived value of bears; and the visitor's preference toward certain bear management practices.

5.4.1 Animals Considered Dangerous

The first attitude and perception interview question asked was: "What animals in the park, if any, do you consider dangerous?" This question was asked before the visitor had any idea about the subject or purpose of the study. This was done to insure there would be no bias in the replies by the visitors. Table 26 shows the response to this question, "Bears," was, by far, the most common (280 - 75.7 percent) response. No one singled out, or specifically identified, black bears as being dangerous while there were 21 (5.6 percent) of the visitors who specifically cited grizzly bears. Taken together, bears and grizzly bears accounted for 301 (81.3 percent) of the total animals considered dangerous.

5.4.2 Preventative Measures

The second attitude and perception examined concerned the willingness of the visitor to take precautions to avoid possible unwanted encounters with bears either before or upon entering the park. Table 27 shows the response to the question "Did you make any inquiries or take any precaution to avoid encountering bears before or upon entering the park?" By far the most common answer by 198 (53.5 percent) visitors was that they either made no inquiries or took no precautions regarding bears before or upon entering the park. For the visitors who answered "yes," they had either made inquiries or had taken precautions to avoid bears, there was no attempt to determine if the precautions taken were appropriate or correct.

Table 28 shows the cross-tabulation of animals considered dangerous with willingness to make inquiries or take precautions regarding bears. It is important to note that of the 280 (75.7 percent) visitors that stated bears to be dangerous, 152 (54.3 percent) either made no inquiries or took no precautions to avoid possible encounters with bears. Also, of the 21 (5.6 percent) visitors that stated grizzly bears to be dangerous, there were 13 (61.9 percent) that made no inquiries or took no precautions to avoid encounters with grizzly bears. In total, 301 (81.3 percent) of the visitors identified bears as being dangerous, while 165 (54.8 percent) made no inquiries or took no precautionary measures to avoid encounters with bears. It cannot be assumed that because the visitor considered bears a dangerous animal, they would take preventative measures to avoid an encounter. The perception of bears being a dangerous animal was operating independently of taking precautionary measures.

5.4.3 Reaction to Bears

The third area examined was the visitor's personal attitude during an encounter with a bear. Although it was not totally realistic to ask a person what they may do in a particular situation, the questioning does at least provide some insight into the attitudes and thinking of the visitors. Table 29 shows the visitor's responses to the question: "What would you do if you encountered a bear at a distance?" The hypothetical situation used was: while hiking you see a bear 100 meters away on a hillside; it is feeding and has not observed you. Of the activities mentioned in Table 31, 210 (56.7 percent) of the replies indicated keeping away from the bear. There were 158 (43.3 percent) of the responses which indicated either remaining stationary or

Table 27. Precautions Taken by Visitors to Avoid Unwanted Encounters with Bears

Precautions	Number	Percent
No	198	53.5
Yes	58	15.7
Yes, read pamphlet(s)	63	17.0
Yes, food precautions	51	13.8
Total	370	100.0

Table 28. Comparison of Animals Considered Dangerous by Precautions Taken by the Visitors

			Precautions Taken		
Animal	No	Yes	Yes, food	Yes, pamphlet	Total
Bears	152	35	45	48	280
No Animals	19	7	3	6	35
Grizzly bear	13	4	1	3	21
Ungulates	7	5	1	4	17
People	2	2	1	2	7
Predators & Snakes	2	3	0	0	5
Unknown	3	2	0	0	5
Total	198	58	51	63	370

Table 29. Visitor's Reaction to Encountering a Bear at a Distance While Hiking

Reactions to Bear	Number	Percent
Move away from the bear, keep distance	199	53.8
Watch bear	119	32.2
Take pictures of bear	27	7.3
Get upwind to bear	11	2.9
Stand still	10	2.8
Get closer	2	.5
Unknown	2	.5
Total	370	100.0

getting closer to the bear. On two occasions the researcher observed, unknown to the public, park visitors watching a bear in situations very similar to the hypothetical situation. One set of observations involved 104 separate visitors watching a medium-sized black bear cross Waterton Lake just below the Prince of Wales Hotel. The distance across the lake would be 100-105 meters. Because there was a lake between the bear and the visitors, the major visitor reaction was to walk out onto a small point of land that extended into the lake in order to get as close as possible to the bear. Once the visitors were as close as the land would permit, they spent several minutes taking pictures and/or just watching the bear. Several visitors that had field glasses stayed in the area an hour or more sharing their field glasses with other visitors. None of the visitors left the area immediately upon learning about the presence of the black bear.

The second observation of park visitors encountering a bear at a distance occurred at the southwest end of the Cameron Lake trail. A small to medium-sized grizzly bear was observed by as many as twenty-five different park visitors. The distance to the bear would have been 150-200 meters. There were times when no visitors were present at the place where the grizzly could be observed. However, as the next visitors arrived at the viewing location, they would stop and commence looking for the grizzly. Upon investigation, it was learned that returning visitors were passing on the information about the bear's location to the other visitors they encountered on the trail. Whether any visitors terminated their hikes upon learning about this grizzly was not determined.

In both of the cases of observing the visitor's behaviour, their reaction was generally in agreement with what they said they would do if encountering a bear at a distance while hiking. In Yosemite National Park, California, 992 interactions between bears and visitors were observed. "The most common responses of visitors to bears were to watch, walk toward, or talk to others and/or point at the bear. Over 65 percent of visitor responses were neutral. People were least likely to react to bears with fear-avoidance behaviour (Hastings, Gilbert and Turner 1981, p 2)."

The second situational question involving encounters with bears was: "What would you do if you encountered a bear at close range?" The hypothetical situation was: You are hiking along a trail and encounter a medium-sized black bear at a distance of 15 meters. Table 30 summarizes the visitor's replies. Nearly 50 percent of the visitors included "backing-up slowly" in their answers. The second most common reply by 80 (21.6 percent)of the visitors was to stand still. There was a significant group (13.5 percent) who said they would either lay down, play dead, or run away as their first reaction. Making noise and trying to scare the bear away was the response by 27 (7.3 percent) of those questioned. Taking these two groups together accounts for 77 (20.8 percent) of the visitors, meaning that 2 out of 10, when encountering a bear at close range, would lay down, play dead, run away, or try to scare the bear away as a first response. When considering laying down, playing dead, and trying to scare the bear away, as either the first and second replies there were 102 (27.6 percent) of the visitors indicated that these reactions were appropriate, whereas in reality the preferred response would be to back up slowly and if the bear begins to follow, then use some form of distraction such as dropping a knapsack or defence reaction like climbing a tree.

In the area of personal attitude, the question of why people were injured by bears was examined. Table 31 shows replies to this question. Except for the one case, all of the replies indicated the injuries were either visitor initiated, caused or related. No one seemed to express an attitude that the reason for visitor injuries was the bears' alone, without some form of visitor involvement or provocation.

5.4.4 Value of Bears

The fourth area of attitude concerned how the visitors valued bears. The specific questions were: "In your opinion of what value, if any, is a bear?" and "What do you like the most about bears?" The visitor's answers to these two questions were analyzed and assigned to one of the ten attitude groupings described by Kellert (1979). Table 32 shows the stated values for bears as assigned and distributed to the categories described by Kellert (1979). The most common value indicated for bears was ecological, indicating a strong concern for the bear as a part of the environment, and the relationship of the bear to the other parts of the ecosystem.

Table 30. Visitor's Reaction to Encountering a Bear at Close Distance While Hiking

Reactions	Number[1]	Number[2]	Total	Percent[3]
Back up slowly	151	33	184	49.7
Stand still	105	19	124	33.4
Laydown, play dead	30	14	44	11.9
Scare bear away	27	7	34	9.2
Climb tree	14	16	30	8.1
Run away from bear	20	4	24	6.5
Get upwind of bear	11	1	12	3.2
Drop knapsack	4	6	10	2.7
Stay on horse	3	-	3	0.8
Get downwind of bear	1	-	1	0.2
Unknown	4	270	-	
Total	370	370		

Note: 1. This column gives the visitor's 1st reply.
2. This column gives the visitor's 2nd reply.
3. The percentage gives the number of times this answer occurred.

Table 31. Visitor's Perception Concerning Why People Were Injured by Bears

Cause of Visitor Injury	Number	Percent
Visitor's fault, careless	185	50.0
Visitor feeding or leaving garbage	51	13.8
Intrude into bear's habitat	51	13.8
Lack of education about bears	41	11.1
Provoke or Antagonize bear	36	9.7
Panic & run (when encountering bear)	5	1.3
Unknown, don't know	1	.3
Total	370	100.0

Table 32. The Value of Bears as Stated by the Visitors

Groupings	Number	Percent
Ecologistic	127	34.4
Aesthetic	81	21.9
Naturalistic	62	16.7
Moralistic	43	11.6
Utilitarian	28	7.6
Negativistic	21	5.7
Humanistic	3	.8
Scientific	2	.5
Doministic	0	-
Neutralistic	0	-
Unknown	3	.8
Total	370	100.0

There was a belief expressed by this same group that bears keep nature in balance. This attitude does not correspond with the diet described for black bears but does agree with the diet described for grizzly bears. It is noted that there were no neutralistic or doministic values stated. No one felt the bears were to be dominated by visitors or were neutral in their stated values.

The visitors were then asked if there was anything they particularly disliked about bears. As indicated in Table 33 the most frequent answer by 141 (38.1 percent) was that they did not dislike anything in particular about bears. This was unexpected considering that 80.4 percent of the visitors believed bears to be dangerous animals. In this study, even though the visitors believed bears to be dangerous animals, it did not necessarily mean that they disliked bears or considered bears as having no value.

5.4.5 Park Management Preferences

The fifth major area examined in the attitude profile concerned certain bear management issues and practices. Table 34 shows the replies to the question: "What types of bear behaviour do you consider troublesome-dangerous?" Over one half the visitors disliked bears coming into or using the same areas they were using, and 45 (12.4 percent) visitors indicated sows and cubs were a problem.

In the event a troublesome situation develops involving a bear, what did the visitors expect the park staff to do with the bear? Each visitor was asked; "What should the park staff do with a troublesome-dangerous bear?" This question is related to the individual visitor's definition of what constituted a troublesome-dangerous bear. Table 35 summarizes what the visitors felt should be done with troublesome-dangerous bears. It is noted that only 11 (3.0 percent) of the visitors wanted the troublesome-dangerous bears killed. The other 359 (97.0 percent) visitors wanted some other management solution when dealing with troublesome-dangerous bears. The comment was often made that the park staff should not kill the bears; the exception was when human life was being directly threatened or if human death had already occurred.

Table 33. Visitor's Stated Reasons for Disliking Bears

Grouping	Number	Percent
Don't dislike bears	141	38.1
Frighten and hurt people	93	25.1
Unpredictable and aggressive	72	19.5
Scavenging conditioned to people	44	11.9
Just don't like bears	8	2.2
Can't see bears	7	1.9
Unknown	5	1.3
Total	370	100.0

Table 34. Troublesome-Dangerous Bear Behaviours

Dangerous Activities	Number[1]	Percent
Raiding campsites for food	173	46.7
Coming close to people	105	28.4
Sows & cubs	45	12.2
Nothing	17	4.6
Standing on hind legs	14	3.8
Hurting people	9	2.4
Unknown	7	1.9
Total	370	100.0

Table 35. Visitor's Management Preferences Concerning What Park Staff Should do With the Troublesome-Dangerous Bears

What to do with bear	Number	Percent
Relocate, do not kill	278	75.1
Close area to visitor	28	7.5
Better education of visitor	24	6.5
Better enforcement	17	4.5
Kill the bear	11	3.0
Do Nothing	7	1.9
Send to zoo	5	1.3
Total	370	100.0

In an effort to further determine the visitor's attitude in these bear management matters, another question was asked: "What should the park staff do with the troublesome bears that keep coming back?" Table 36 outlines the replies to the returning bear situation. If the information in Table 37 is reorganized into the non-kill and kill options, then the percentages were 77.0 percent and 20.9 percent, respectively. On two separate occasions during the interview process, park staff killed bears in public view. One occurrence was at Crandell Lake Campground, where a small black bear was shot while in the campground. The next day by random selection several interviews were conducted at that campground; the researcher was not aware of the bear being killed until the interviews commenced. The visitors who had witnessed the bear being killed were very angry with the park staff and felt they were owed some explanation or forum to discuss the shooting.

There were two interviews terminated because the feelings of the visitors were so strong in demanding answers about the bear's death. Several people that had experienced the bear shooting asked: "What right do they (the park staff) have in killing our wildlife?" The visitors did not understand the park's actions, and there were very strong feelings concerning this issue.

5.4.6 Priority of Use: Man or Bears

The last attitude issue examined pertained to the priority of use of a valley in the park. Since the National Parks Act and the Bear Management Plan both provide mechanisms for limiting public use of park lands, how did the feel about having their use restricted? The specific question was: "If a decision had to be made concerning the use of a valley in the park who should have first priority, people or bears?" Table 37 outlines the responses concerning who should have priority. In total 276 (74.6 percent) visitors gave priority to the bears.

At the other end of this issue, there were 24 (6.5 percent) of the visitors that gave the priority to the people. In the middle area, there was a compromise by 70 (18.9 percent) of the visitors to accommodate both bears and visitors. There were 276 visitors favoring bears as compared to 24 favoring visitors; about an 11 to 1 ratio favoring bears over visitors as the

Table 36. Visitor's Management Preferences Concerning What Park Staff Should do With Troublesome Bears that Return

What to do with the bear	Number	Percent
Take further away, do not kill	254	68.7
Kill the bear	56	15.1
Kill if people were hurt	22	5.9
Close area to visitor	17	4.6
Move campsite if necessary	13	3.5
Unknown	8	2.2
Total	370	100.0

Table 37. Visitor's Management Preferences Concerning the Priority for Use of a Valley in the Park

Priority for Use	Number	Percent
Bears	276	74.6
Zone for both bears/visitors	70	18.9
Visitors	24	6.5
Total	370	100.0

preferred management strategy for assigning the priority for use of a valley in the park. For this question no references were made to any particular valley in the park.

5.5 Visitor's Attitudes and Socio-demographic Characteristics

The fourth objective of the study was to determine which socio-demographic characteristics had a significant effect on: 1) stated value for bears; 2) priority for the use of a valley in the park; 3) willingness to take precautions against an unwanted encounter with bears and; 4) the level of biological knowledge concerning bears. The socio-demographic characteristics that were tested to determine if they had any significant effect were: 1) knowledge about bears; 2) history of working with animals; 3) previous involvement with hunting, fishing, or trapping; 4) current involvement with hunting, fishing, or trapping; 5) source of information on bears; 6) age; 7) sex; 8) level of education; 9) size of visitor's current home area; 10) location in park at time of interview; 11) the type of park user and; 12) current occupation of the visitor.

5.5.1 Values for Bears and Socio-demographic Characteristics

Proposition 1: The visitor's socio-demographic characteristics will not significantly effect the stated values for bears. The visitor's stated values for bears were affected by the following socio-demographic characteristics: levels of biological knowledge about bears; ages of the visitors; sizes of current home area; and the types of park users.

5.5.1.1 Value of Bears and Level of Biological Knowledge About Bears

Table 38 shows the chi-square contingency analysis for the value of bears by the four levels of the total bear knowledge scores. The computed chi-square value was 33.90. The corresponding value from a chi-square table, using $p=0.05$ at 15 degrees of freedom was 24.99. The fact that the computed value is greater than the table value, the proposition was not affirmed. The data support the proposition that the level of knowledge about bears was related to the value the visitors had for bears.

Table 38. Visitor's Value of Bears Compared to Total Bear Knowledge Scores

	Total Biological Bear Knowledge Scores				
Value of Bear	7-13	14-20	21-27	28-35	Total
Ecological Scientific	3 4.9 (.77)	62 48.5 (3.78)	39 52.1 (3.29)	18 16.5 (.14)	122
Aesthetic	4 3.3 (.16)	27 32.2 (.83)	39 34.6 (.56)	11 10.9 (.00)	81
Naturalistic	3 2.5 (.09)	17 24.6 (2.36)	34 26.5 (2.14)	8 8.4 (.02)	62
Moralistic Humanistic	1 2.1 (.61)	22 21.1 (.04)	21 22.6 (.12)	9 7.2 (.47)	53
Utilitarian	0 1.1 (1.14)	7 11.1 (1.53)	18 12.8 (3.05)	3 3.8 (.16)	28
Negativistic	4 1.0 (9.42)	12 9.5 (.64)	7 10.2 (1.03)	1 3.2 (1.55)	24

The first number is the observed frequency.
The second number is the expected frequency.
The third number is the chi-square value.

From Table 38, the highest chi-square value of 9.42 came from the lowest, 7-13, total bear knowledge scores that had negativistic values concerning bears. The expected frequency for that particular cross-tabulation was one response, whereas four were recorded. At the other extreme, a chi-square value of 1.2 came from cross-tabulation of the highest (28-35) total bear knowledge scores and negativistic value of bears. The expected frequency for that particular cross-tabulation was three, whereas only one was recorded. The data suggest that higher levels of bear knowledge will reduce the negative values the visitor have toward bears.

5.5.1.2 Value for Bears and Age of the Visitor

Table 39 shows the chi-square contingency analysis for the value of bears by the age groupings of the visitors. The computed chi-square value was 27.98. The corresponding value from a chi-square value, using p=0.05 with 10 degrees of freedom, is 18.30. The fact that the computed chi-square value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that age of the visitor was related to the value of bears. The interaction of 65+ years-old and utilitarian value results in a 13.79 chi-square value. The expected frequency for the interaction of these variables was 1.9, whereas seven occurrances were observed, indicating that the visitors in the 65+ year-old group had a higher than expected frequency for utilitarian values for bears.

5.5.1.3 Value of Bears and Population Size of Current Home Area

Table 40 shows the chi-square contingency analysis for the value of bears by the population size of the visitor's current home area. The computed chi-square value was 23.03. The corresponding value from a chi-square table, using p=0.05 with 10 degrees of freedom, is 18.30. The fact that the computed chi-square was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the population size of the visitor's current home area was related to the value of bears. As can be seen in Table 40, the interaction of visitors from 1–20,000 population size current home areas and

Table 39. Value of Bears Compared to the Age of the Visitors

		Age Group		
Value of Bears	12-24	25-64	65+	Total
Ecological Scientific	49 41.2 (1.47)	68 72.5 (.28)	5 8.2 (1.28)	122
Aesthetic	32 27.4 (.79)	43 48.2 (.55)	6 5.5 (.05)	81
Naturalistic	14 20.9 (2.30)	45 36.9 (1.80)	3 4.2 (.34)	62
Moralistic Humanistic	13 17.9 (1.34)	38 31.5 (1.34)	2 3.6 (.70)	53
Utilitarian	7 9.5 (.64)	14 16.6 (.42)	7 1.9 (13.79)	28
Negativistic	10 8.1 (.44)	12 14.3 (.36)	2 1.6 (.09)	24

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

Table 40. Value of Bears Compared by Population Size of the Visitor's Current Home Area

	Population size of visitor's current home area		
Value of Bear	1-20,000	20,001-100,000	100,001+
Ecologistic Scientific	37	34	51
	29.7	34.6	57.7
	(1.81)	(.01)	(.78)
Aesthetic	26	27	28
	19.7	23.0	38.3
	(2.01)	(.70)	(2.78)
Naturalistic	7	21	34
	15.1	17.6	29.3
	(4.38)	(.66)	(.75)
Humanistic Moralistic	8	15	30
	12.9	15.0	25.1
	(1.86)	(.00)	(.97)
Utilitarian	8	4	16
	6.8	7.9	13.2
	(.21)	(1.96)	(.57)
Negativistic	4	4	16
	5.8	6.8	11.4
	(.58)	(1.16)	(1.90)

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

naturalistic value accounted for 4.38 of the 23.03 total computed chi-square value. The visitors from 1-20,000 population size current home areas had a lower than expected frequency of naturalistic values for bears. Visitors from smaller communities did not have as high a naturalistic value for bears as the other values or the visitors from larger population size areas.

5.5.1.4 Value of Bears and Category of Park Visitor

Table 41 shows the chi-square contingency analysis for the value of bears by the category of visitor. The computed chi-square value is 20.12. The corresponding value from a chi-square table, using p=0.05 with 10 degrees of freedom, is 18.30. The fact that the computed chi-square value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the category of visitor was related to the value of bears. As can be seen in Table 43, the largest chi-square value of 4.44 is the interaction of the higher than expected ecological value by the day-visitors. The hard-sided-user group had a lower than expected frequency for ecological value. These data indicate that hard-sided vehicle users had a lower ecological and higher utilitarian value for bears than other types of users.

In summary none of the other socio-demographic characteristics was found to have any significant affect on the visitor's stated values for bears. These nonsignificant characteristics included: history of working with wildlife; previous history of hunting, fishing or trapping; current participation in hunting, fishing or trapping; sources of information on bears; sex of visitors; current levels of education; and interview locations.

5.5.2 Priority for Valley Use and Socio-demographic Characteristics

Proposition 2. The visitor's socio-demographic characteristics will not significantly effect the stated priorities for the use of a valley in the park. The priorities for the use of a valley in the park were significantly affected by the following socio-demographic characteristics: sources of information; ages of the visitors; current levels of education; interview locations; and

Table 41. Visitor's Value of Bears Compared to Type of Visitor

Value of Bear	Hard Sided	Tent Users	Day Users
Ecological Scientific	34	56	32
	47.8	52.1	22.1
	(3.99)	(.29)	(4.44)
Aesthetic	30	37	14
	31.7	34.6	14.7
	(.10)	(.17)	(.03)
Naturalistic	25	26	11
	24.3	26.5	11.2
	(.02)	(.01)	(.00)
Humanistic Moralistic	28	21	4
	20.8	22.6	9.6
	(2.52)	(.12)	(3.26)
Utilitarian	16	9	3
	11.0	12.0	5.1
	(2.30)	(.73)	(.85)
Negativistic	12	9	3
	9.4	10.2	4.3
	(.72)	(.15)	(.42)

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

the types of park visitors.

5.5.2.1 Valley Priority and Sources of Information

Table 42 shows the chi-square contingency analysis for priority use of a valley by the visitor's source of information. The computed chi-square value was 20.78. The corresponding value from a chi-square table, using p=0.05 with 10 degrees of freedom, is 18.30. The fact that the computed chi-square value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the sources of information were related to the visitor's management preferences about the priority for the use of a valley in the park. The largest chi-square value of 5.51 comes from the interaction of personal experience and visitor priority for the use of a valley in the park. The expected value chi-square frequency for this interaction was 3.6, whereas the observed frequency was eight. This indicates that as a result of a personal encounter with a bear, there was a higher than expected frequency for the visitor's management preference concerning the use of a valley to favor visitors over bears, or both bears and visitors.

5.5.2.2 Valley Priority and Age of the Visitor

Table 43 shows the chi-square contingency analysis concerning the visitor's management preferences for the priority use of a valley by age groupings. The computed chi-square value was 12.31. The corresponding value from a chi-square table, using p=0.05 with 4 degrees of freedom, is 9.48. The fact that the computed chi-square value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that ages were related to the priority for the use of a valley in the park. As shown by Table 43, the 65+ year-old age group accounted for 9.72 of the 12.31 total computed chi-square value. The 65+ year-old group had a lower than expected frequency for choosing bears and a higher than expected frequency for choosing either visitors or both bears and visitors using a valley in the park.

Table 42. Visitor's Management Preferences Concerning Valley Priority Compared to Source of Information about Bears

	Source of Information						
Valley Priority	T.V., Shows, Books	Pamphlets	Personal Experience	Hunter Training	No Source	Park Staff, Bear & Man Film	Total
Bears	70 68.6 (.03)	100 98.5 (.02)	43 41.0 (.09)	24 29.1 (.89)	15 13.4 (.18)	24 25.4 (.07)	276
People	3 6.0 (1.48)	7 8.6 (.29)	8 3.6 (5.51)	5 2.5 (2.41)	1 1.2 (.02)	0 2.2 (2.21)	24
Both	19 17.4 (.15)	25 25.0 (.00)	4 10.4 (3.94)	10 7.4 (.93)	2 3.4 (.58)	10 6.4 (1.98)	70

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

Table 43. Visitor's Management Preferences Concerning the Valley Priority Compared to Age of the Visitor

	Age Group			
Valley Priority	17-24	25-64	65+	Total
Bears	101	163	12	276
	93.2	146.1	18.6	
	(.65)	(.01)	(2.37)	
Visitors	6	14	4	24
	8.1	14.3	1.6	
	(.55)	(.01)	(3.49)	
Both	18	43	9	70
	23.6	41.6	4.7	
	(1.35)	(.05)	(3.86)	

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

Table 44. Management Preferences Concerning Valley Priority Compared to Population Size of the Visitor's Current Home Area

	Population Size of Home Area		
Valley Priority	1-20,000	20,001-100,000	100,000+
Bears	71	86	119
	67.1	78.3	130.5
	(.22)	(.75)	(1.02)
Visitors	8	4	12
	5.8	6.8	11.4
	(.80)	(1.16)	(.04)
Both	11	15	44
	17.0	19.9	33.1
	(2.13)	(1.19)	(3.58)

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

5.5.2.3 Valley Priority and Population Size of Current Home Area

Table 44 shows the chi-square contingency analysis for the priority for valley use by the size of the visitor's current home area. The computed chi-square value was 10.90. The corresponding value from a chi-square table, using p=0.05 with 4 degrees of freedom, is 9.48. The fact that the computed chi-square was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the population sizes of the visitor's current home areas were related to the management preference concerning the priority for the use of a valley in the park. As can be seen in Table 44, the largest chi-square value of 3.58 comes from the interaction of visitors from 100,000 + population size of the current home areas and valley priority of both, visitors and bears. These data suggest that the visitors from the larger population areas had a higher than expected frequency to give the priority for the use of a valley to both bears and visitors.

5.5.2.4 Valley Priority and Interview Location

Table 45 shows the chi-square contingency analysis for the priority use of a valley in the park by the visitor's location at the time of the interview. The computed chi-square value was 22.58. The corresponding value from a chi-square table, using p=0.05 with 8 degrees of freedom is 15.50. The fact that the computed chi-square value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the visitors interviewed at different locations in the park were feeling differently about the priority for the use of a valley in the park. As can be seen in Table 45, the interaction of trail users and both bears and visitor's valley priority accounted for 4.63 of the 22.58 total computed chi-square value. Trail users had a much smaller than expected frequency for both bears and visitors and had a higher than expected frequency for visitors. Not unexpectedly trail users had a management priority for visitors over bears and not both bears and visitors.

Table 45. Management Preference Concerning Valley Priority Compared to Visitor's Location in the Park During the Interview

	Visitor's Location at time of Interview				
Valley Priority	Crandell	Cameron	Trails	Info Centre	Townsite
Bears	80 76.8 (.13)	35 37.5 (.14)	36 32.1 (.48)	34 27.6 (1.48)	91 102.2 (1.23)
Visitors	7 6.7 (.02)	1 3.2 (1.55)	5 2.8 (1.75)	0 2.4 (2.40)	11 8.9 (.50)
Both	16 19.5 (.62)	14 9.5 (2.18)	2 8.1 (4.63)	3 7.0 (2.29)	35 25.9 (3.18)

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

Table 46. Visitor's Management Preferences Concerning the Valley Priority Compared to Visitor Type

Valley Priority	Hard Sided	Tent Users	Day Users	Total
Bears	92 108 (2.42)	121 118 (.08)	63 50 (3.39)	276
Visitors	18 9 (7.85)	6 11 (.04)	0 4 (5.94)	24
Both	35 27 (2.09)	31 30 (.04)	4 13 (5.94)	70

First number is observed frequency.
Second number is expected cell frequency.
Third number is chi-square value.

5.5.2.5 Valley Priority and Category of Park Visitors

Table 46 shows the chi-square contingency analysis for the priority for the use of a valley in the park by the category of visitors. The computed chi-square value was 27.92. The corresponding value from a chi-square table, using p=0.05 with 4 degrees of freedom, is 9.48. The fact that the computed chi-square value was much larger than the table value, the proposition was not affirmed. The data supported the conclusion that the category of visitors were related to the priority for the use of a valley in the park. As can be seen in Table 46, hard-sided vehicle visitors had a much higher observed frequency for giving the valley priority to visitors than expected. They also had a lower than expected frequency to give the valley priority to the bears. The day-use visitors had a higher than expected frequency to give the priority to bears. They also had a much lower frequency than expected to give the priority to visitors. This data strongly suggested that the hard-sided users and day-users are expressing opposing tendencies concerning who should have the priority for the use of a valley in the park. Overall, there is still a strong belief by 276 (74.6 percent) of the visitors indicating that bears should receive management priority when considering the use of a valley in the park.

In summary none of the remaining socio-demographic characteristics that were tested were found to have any significant affect on the visitor's stated priorities for the use of a valley in the park. The nonsignificant characteristics included: the level of knowledge about bears; history of working with animals; previous history of hunting, fishing, or trapping; current participation in hunting, fishing, or trapping; sex of visitors; and current levels of education.

5.5.3 Visitor's Willingness to take Precautions

Proposition 3. The visitor's socio-demographic characteristics will not significantly effect the stated willingness to take precautions to avoid encounters with bears. The willingness to take precautions to prevent encounters with bears was significantly affected by the following socio-demographic characteristics: the sources of information on bears; age of the visitors; the current levels of education; interview locations in the park; and the type of park visitor.

5.5.3.1 Precautions and Sources of Information

Table 47 shows the chi-square contingency analysis between the making of an inquiry or taking of precautions to prevent encounters with bears by the visitor's source of information about bears. The computed chi-square value was 36.70. The corresponding value from a chi-square table, using p=0.05 with 5 degrees of freedom, is 11.07. The fact that the computed chi-square value was much larger than the table value, the proposition was not rejected. The data supported the conclusion that the sources of information were related to the making of an inquiry or taking precautions against encounters with bears. The data in Table 47 strongly suggest that while T.V., movie shows, and books do not relate to the visitors taking precautions against encounters with bears, while the pamphlets, park staff, and the "man and bear" film did relate to the visitors taking precautionary measures. Apparently, there were different precautionary measures taken by the visitors according to their source of information.

5.5.3.2 Precautions and Age of Visitors

Table 48 shows the chi-square contingency analysis for taking precautions by the various age groups. The computed chi-square value was 6.20. The corresponding value from a chi-square table, using p=0.05 with 2 degrees of freedom is 5.99. The fact that the computed chi-square value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the ages of the visitors were related to the making of inquiries or taking precautions regarding encounters with bears. As can be seen from Table 48, the 65+ year-old group accounted for 5.08 of the 6.20 total computed chi-square value. These 65+ year-old visitors had a much higher than expected frequency for not taking precautions and a lower than expected frequency of taking precautions

Table 47. Bear Encounter Precautions Taken Compared to Source of Information About Bears

	Information Source					
Inquiry/ Precaution	T.V., Shows, Books	Pamphlets	Personal Experience	Hunter Training	No Source	Park Staff, Bear & Man Film
No	67 49 (6.41)	52 71 (4.92)	32 29 (.22)	27 21 (1.80)	10 10 (.02)	10 18 (3.69)
Yes	25 43 (7.38)	80 61 (5.66)	23 26 (.26)	12 18 (2.07)	8 8 (.02)	24 16 (4.25)

First number is cell frequency.
Second number is the expected cell frequency.
Third number is the chi-square value.

Table 48. Bear Encounter Precautions Compared to the Age of the Visitors

Inquiry/Precaution	12-24	Age Groups 25-64	65+	Total
No	61 66.9 (.52)	118 117.7 (.00)	19 13.4 (2.36)	198
Yes	64 58.1 (.60)	102 102.3 (.00)	6 11.6 (2.72)	172

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

Table 49. Bear Encounter Precautions Taken Compared to Educational Level of the Visitors

Inquiry/Precautions	7-12 yrs.	Years of Education Completed College	Graduate
No	97 87.8 (.97)	90 91.5 (.02)	11 18.7 (3.19)
Yes	67 76.2 (1.12)	81 79.5 (.03)	24 16.3 (3.67)

First number is cell frequency.
Second number is expected frequency.
Third number is chi-square value.

against encounters with bears.

5.5.3.3 Precautions and Educational Levels

Table 49 shows the chi-square contingency analysis for taking precautions against encounters with bears by the educational attainments of the visitors. The computed chi-square value was 9.01. The corresponding value from a chi-square table, using p=0.05 with 2 degrees of freedom is 5.99. The fact that the computed chi-square value was much larger than the table value, the proposition was not affirmed. The data supported the conclusion that the visitor's educational level was related to the making of an inquiry or the taking of precautions against encounters with bears. As can be seen from Table 49, the visitors with graduate level education accounted for 6.86 of the total 9.01 chi-square value. Visitors with graduate education had a much lower than expected frequency for not taking precautions and a higher than expected frequency for taking precautions. Park visitors with graduate level educations were more likely to make an inquiry or take precautions preventing encounters with bears than other visitors.

Table 50 shows the chi-square contingency analysis for taking precautions against encounters with bears by the visitor's location in the park at the time of the interview. The computed chi-square value was 21.14. The corresponding value from a chi-square table, using p=0.05 with 4 degrees of freedom, is 9.48. The fact that the computed chi-square value was much larger than the table value, the proposition was not affirmed. The data supported the conclusion that the visitor's location in the park at the time of the interview was strongly related to the taking of precautions against encounters with bears. As can be seen in Table 50, the visitors at the information centre account for 8.41 of the 21.14 total computed chi-square value. These visitors had a lower than expected frequency for not taking precautions and higher than expected frequency for taking precautions. The visitors interviewed at the information centre were either there for information concerning bears or were being encouraged to take precautions regarding encounters with bears. It should be noted that the trail users were not significantly different in either taking or not taking

Table 50. Bear Encounter Precautions Compared to Visitor's Location in the Park During the Interview

	User Location				
Precaution	Crandell	Cameron	Trails	Info Centre	Townsite
No	45 55.1 (1.86)	33 26.8 (1.46)	22 23.0 (.04)	11 19.8 (3.91)	87 73.3 (2.56)
Yes	58 47.9 (2.14)	17 23.2 (1.68)	21 20.0 (.05)	26 17.2 (4.50)	50 63.7 (2.94)

First number is observed frequency.
Second number is expected frequency
Third number is chi-square value.

Table 51. Bear Encounter Precautions Taken Compared to Categories of Park Visitors

Precaution taken	Hard Sided	Tent Users	Day Users	Total
No	99 78 (5.90)	63 84 (5.49)	36 36 (.00)	198
Yes	46 67 (6.80)	95 74 (6.32)	31 31 (.00)	172

First number is observed frequency.
Second number is expected frequency.
Third number is chi-square value.

precautions against encounters with bears as compared to the other users.

5.5.3.4 Precautions and Categories of Park Visitor

Table 51 shows the chi-square contingency for taking precautions against encounters with bears by the different types of visitors in the park. The computed chi-square value was 24.52. The corresponding value from a chi-square table, using p=0.05 with 2 degrees of freedom, is 9.48. The fact that the computed chi-square value was much larger than the table value, the proposition was not affirmed. The data supported the conclusion that the type of visitors was strongly related to whether or not precautions were being taken regarding encounters with bears. As can be seen from Table 51, the visitors using hard-sided vehicles had a higher than expected frequency for not taking precautions against encounters with bears and a lower than expected frequency for taking precautions. The visitors using tents had just the opposite tendencies. Overall, there were 198 (53.5 percent) of the visitors that did not take precautions either before or upon coming into the park.

In summary none of the remaining socio-demographic characteristics that were tested were found to have any significant affect on the visitor's stated willingness to take precautions against encounters with bears. These six nonsignificant socio-demographic characteristics included: levels of knowledge about bears; history of working with animals; previous experience of hunting, fishing, or trapping; current participation with hunting, fishing, or trapping; sex of visitors; and population size of visitor's current home areas.

5.5.4 Visitor's Knowledge About Bears and Socio-demographic Characteristics

Proposition 4. The visitor's socio-demographic characteristics will not significantly effect the levels of biological knowledge about bears. Since cognative knowledge is one of the three primary factors involved in social behavioural research, several socio-demographic characteristics were examined for their possible effects on the visitor's level of knowledge about bears. The visitor's knowledge about bears was significantly affected by the following four socio-demographic characteristics: sources of information concerning bears; age of visitors;

current levels of education; and the type of park visitors.

5.5.4.1 Knowledge About Bears and Sources of Information

Table 52 shows the results of a one-way analysis of variance on the total-knowledge scores by the different sources of information about bears. The computed F value was 5.16. The corresponding value from an F table, using p=0.05, is 1.96. The fact that the computed F value was much larger than the table value, the proposition was not affirmed. The data supported the conclusion that the visitor's sources of information were related to their level of knowledge about bears. As can be seen from Table 52, the "Bear and Man" film and park staff had the greatest impacts on the visitor's total bear knowledge scores. It is also noted that the pamphlets were used the most but were intermediate in relationship to the visitor's total bear knowledge scores.

5.5.4.2 Knowledge About Bears and Age of the Visitors

Table 53 shows the results of a one-way analysis of variance on the total bear knowledge scores by the various age groups. The computed F value was 3.44. The corresponding value from a F table, using p=0.05, is 2.12. The fact that the computed F value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the ages of the visitors were related to the level of their knowledge about bears. As can be seen in Table 53, the 12-17 year olds had the highest mean total bear knowledge scores.

5.5.4.3 Knowledge of Bears and Educational Level

Table 54 shows the results of a one-way analysis of variance on the total bear knowledge scores by the visitor's current educational level. The computed F value was 3.51. The corresponding value from an F table, using p=0.05, is 3.02. The fact that the computed F value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the visitor's educational levels were related to the knowledge about bears. The visitors with graduate level training had a significantly higher level of total

Table 52. Total Bear Knowledge Scores Analyzed by Visitor's Source of Information on Bears

Source of Information	N	Mean Total Knowledge Score	Std. Dev.
"Bear & Man" Film	14	26.14	5.14
Park Staff	20	24.70	3.67
Personal Experience	55	23.51	6.07
Books & Magazines	59	22.02	4.84
Pamphlets	132	21.42	5.14
Hunter Training	36	21.11	4.06
Tour Guides	3	20.00	5.00
Media, Movies	33	19.48	3.79
No Source	15	17.60	2.92
Unknown	3	-	—

Table 53. Visitor's Total Bear Knowledge Scores Analyzed by Age Groups

Age Group	N	Mean Total Knowledge Score	Std. Dev.
12-17	11	24.18	4.75
18-24	114	20.52	4.37
25-34	118	21.61	5.36
35-44	38	22.68	5.27
45-54	27	21.41	5.63
55-64	37	24.14	5.16
65+	25	22.96	5.26

Table 54. Visitor's Total Bear Knowledge Scores Analyzed by Educational Levels

Educational Level	N	Mean - Total Knowledge Score	Std. Dev.
Jr & Sr High School	164	21.94	5.10
College — BSc	171	21.25	4.66
Graduate School	35	23.71	6.91

Table 55. Visitor's Total Bear Knowledge Scores Analyzed by Type of Visitors

Type of Visitor	N	Mean Total Knowledge Score	Std. Dev.
Overnight hard sided	145	22.70	5.57
Overnight tent	158	21.38	4.93
Day user	67	20.78	4.34

knowledge about bears than any other educational group.

5.5.4.4 Knowledge About Bears and Categories of Visitors

Table 55 shows the results of a one-way analysis of variance on the total bear knowledge scores by the different types of visitors. The computed F value was 4.10. The corresponding value from an F table, using $p=0.05$, is 3.02. The fact that the computed F value was larger than the table value, the proposition was not affirmed. The data supported the conclusion that the type of visitor was related to the total knowledge about bears. It is important to see that the overnight tent visitors were in the intermediate group. The overnight visitors using hard-sided vehicles had the highest total bear knowledge scores. The day users had the lowest total bear knowledge scores.

In summary none of the remaining socio-demographic characteristics that were tested were found to have any significant affect on the visitor's stated knowledge about bears. These seven nonsignificant socio-demographic characteristics included: history of working with wildlife or domestic animals; previous experience of hunting, fishing, or trapping; current participation in hunting, fishing, or trapping; current occupation of the visitors; population size of current home area; location in park at time of interview; and the sex of the visitor.

6. DISCUSSION AND CONCLUSIONS

6.1 Introduction

The study objectives were to determine the visitor's attitudes, perceptions, and knowledge of bears in Waterton Lakes National Park, Canada. These attitudes, perceptions, and knowledge were determined, and their relationships with visitor characteristics were also examined.

As park managers work toward the stated goals of maintaining natural populations of black and grizzly bear, while minimizing the danger of injury and loss of life to the visitor, new information and strategies may be required because of the growing demands being placed on park lands by the visitors.

The biological and behavioural elasticity of bear populations is limited. The bears can only be manipulated so far before their biological and social adaptabilities are exhausted. The elasticity of human attitudes, perceptions, practices, preferences, and knowledge have yet to be fully explored or understood. This study, in conjunction with previous behavioural research, was attempted to clarify the interworkings of these human emotions and practices while they were in bear-occupied habitats.

6.2 Socio-Demographic Characteristics of Visitors

In the sample of 370 visitors, 80 percent indicated that they had visited Banff during the past year. It was very common for the visitors to also visit many other national parks. A large number of these parks have black or grizzly bear populations. Almost without exception the visitors indicated that they would not act or answer the questions any differently in these other parks. The presence of bears was not apparently deterring the visitors from coming to Waterton Lakes National Park.

Of the sample, 27.6 percent had completed college degrees (Table 35). This was very high as compared to U.S.A. or Canadian populations in general where only 10 percent of the public has completed college. The sex, age, and occupational characteristics were very similiar to the figures previously cited by Mihalic (1974) and Thorsell (1967).

The origins of the visitors in the present study are different from Thorsell's (1967) study where nearly one half the visitors were from the U.S.A. In the present study the largest group of visitors (53.0 percent) were from Alberta. This was encouraging in the sense that these visitors were within a limited area if park managers decided to deliver new or revised information on bears. The majority of the visiting public to Waterton Lakes National Park were within the potential area of an Alberta-based information program.

6.3 Visitor's Knowledge about Bears

One of the main objectives of this study was to determine the visitor's knowledge about both grizzly and black bears. It is evident that the visitors perceived the diet of black bears to be vegetarian with the occasional opportunistic meal of animals. Grizzlies on the other hand were viewed as predators, consuming large quantities of animal matter. This agreed very well with the visitor's stated ecological value of grizzly bears of maintaining a "balance in nature." Quite clearly the general public have serious misconceptions concerning the diet and ecological role of grizzly bears. There were 353 visitors (95.4 percent) who felt that bears could run as fast or faster than a man; however, 24 visitors (6.5 percent) answered that an appropriate defence strategy when encountering a bear was to attempt to outrun the bear. There appears to be a minor inconsistency between the knowledge of how fast bears can run and the application of this knowledge when encountering bears. Hastings (1983) indicated that behaviours involving human fear were the most likely to preceed an incident of bear agression. These 24 (6.5 percent) visitors who indicated they would try to outrun the bear are in need of correct information concerning their behaviour during encounters with bears. The behaviour of the visitors, attempting to run away, may be encouraging aggressive behaviour by the bears.

When the visitors stated how they would distinguish between black and grizzly bears, 60.0 percent indicated that size of the bear was a reliable distinguishing characteristic. Grizzly bears were thought by the visitors to be much larger than they are in real life. This may be a serious misconception because only the largest adult grizzlies would be correctly identified as grizzly bears by the visitors, with all other smaller bears being identified as black bears. In the sample 45.4 percent of the visitors indicated that color was a good characteristic to use when trying to distinguish between the two species. The most common error by the visitors was to think that grizzlies were light to dark brown in color with all black or dark-colored bears being black bears. There was very little awareness by the visitors concerning the range of colors exhibited by both species. From a management perspective this may lead to some serious errors through attempting to collect information about bear populations from sightings by the general park visitor. Any program that regularly collects from the general visitor information about their sighting of bears will have to apply caution to avoid the collection of false or misleading information.

When considering the visitor's mean knowledge-value scores for diets and adult weights for both black and grizzly bear, it was apparent that the visitor knew more correct information about black bears. The visitor's general knowledge about both bear species was characterized by misconceptions of diet, weights, and distinguishing characteristics for grizzly bears. The visitors averaged 52.6 percent correct answers to the seven life history questions involving both species.

6.4 Visitor's Attitudes About Bears

Of the visitors, 81.4 percent specified bears or grizzly bears as being dangerous animals, while none specifically identified black bears as dangerous. Of the 81.4 percent that identified bears or grizzly bears as being dangerous animals 54.8 percent of the visitors did not make any inquiries or take any precautions against any unwanted encounters with bears. There was a vast difference between considering bears as being dangerous animals and taking precautions to prevent encounters. It appeared that the perception of bears as being dangerous animals was operating independently from the visitor's behaviour of taking precautions. This difference between perception and behaviour was consistent with the work of Wicker (1969) who also emphasized that there was a difference between an attitude and observed behaviour.

It was further found that those visitors with high (25-35) total biological knowledge scores did not display a higher than expected frequency for taking the precautionary measures against any unwanted encounters. The data suggested that a cognitive (factual knowledge) level about bears had very little if any relationship with whether or not the visitors were taking precautionary measures against any unwanted encounters with bears. This lack of correlation between knowledge of bears and visitor's behaviour (precautions), suggests that the affective and cognitive component needs further examination. In addition, Hastings, Gilbert and Turner (1981) found 92 percent of the visitors indicated they were taking precautions for bears, while in fact only three percent of the visitors were actually taking or using correct precautions. The actual rate of correct precautions by visitors in Waterton Lakes National Park is unknown. A study of precautions taken would be of great assistance in clarifying the public's cognitive (information) and may identify additional management and information needs.

In the present study a large segment of the visitors (81.4 percent) identified bears as dangerous. Yet, 54.8 percent of those visitors indicated no precautions were being taken regarding encounters with bears. Possible reasons for this lack of precautions might be: 1) they considered their probability of being hurt by a bear as very low; 2) they felt getting attacked by bears always happens to the "other guy", 3) if the "other guy" did get hurt by a bear, it was that visitor's fault, 4) park officials regularly patrol the area, 5) they considered their current activities to be appropriate, and 6) they felt they could take care of themselves if a bear was encountered. No attempt was made to determine if the precautions taken by the remaining 45.2 percent of the visitors who made inquiries or took precautions were appropriate or correct. On several occasions the visitors said they had or were taking precautions. In reality many of these precautions were either inadequate or incorrect. For example, a family of six were camping at Crandel campground. The parents were sleeping in a tent near the car, while the children slept in the back of the station wagon. The parents had taped various food items to the car windows so the children could observe the deer as they took the food. The father, when interviewed, said they had taken many precautions to prevent encounters with bears. That was why the children were sleeping in the station wagon instead of the tent. On another occasion, a family had indicated they had taken all the known precautions against encounters with bears, yet their food was in a cooler under the picnic table. This family complained about how a deer had eaten some bread which was stored in the cooler. Also during this same interview a female mule deer was licking the family's barbeque grill which was left lying on the ground. In all of these situations, the visitors felt that appropriate precautionary measures were being taken. In reality it was quite possible that many of the precautions being taken by the visitors were inadequate or incorrect. This attitude of not taking precautions was not well understood and should be examined by future research. Also the actual precautionary measures that were being practiced by the park visitors need study and examination. There is a strong likelihood that the park visitors simply did not know appropriate precautions to avoid encounters with bears.

6.5 Visitor's Attitude Concerning Bear Management Issues

Although 81.4 percent of the visitors considered bears or grizzly bears as being dangerous animals, this does not mean they disliked bears. There was a general tendency for the visitors to dislike any bear that might venture into areas the visitors were using. However, only 2.2 percent of the visitors indicated a general dislike for bears. In fact, when asked about what they would do in an encounter with a bear at a distance, 39.4 percent of the visitors said they would like to watch the bear or take pictures. This was not consistent with the figures reported by Hastings, Gilbert and Turner (1981) where 65 percent of visitors involved with bear encounters watched or took pictures of the bear.

The responses to encountering a hypothetical black bear on a trail at close distances (15 m) revealed some very positive reactions, where 61.4 percent of the visitors said that an appropriate reaction would be to back up slowly or just stand still. However, there were some visitors who gave some potentially very dangerous responses to encountering a bear at close distance. In total 18.4 percent of the visitors gave, as either their first or second answers, the following: lying down or playing dead (11.9 percent), or attempt to get away by out running the bear (6.5 percent). These two responses taken together represented 18.4 percent of the visitors.

When examining the reasons the visitors gave for why people were attacked by bears, it was interesting to note that all the reasons given for fatal and non-fatal injuries were visitor related or provoked. The visitors perceived the public as the principal source of problems when considering visitor injury and problem bears. This may, in part, explain the overwhelming tendency for not wanting the so-called "problem bears" to be killed. Only 3.0 percent of the visitors indicated killing the "problem bear" was an appropriate management solution.

The visitors, after answering the question concerning what the park staff should do with "problem bears," were presented with a scenario that involved the "problem bear" returning to its original location and again getting into trouble. Of the visitors 68.7 percent still did not want the bear killed as a management solution to the situation. The overall preference was to keep the bears alive and adjust the visitor's use of the areas involved if necessary.

The last management question examined involved the priority for the use of a valley in the park. By far the most common attitude, expressed by 74.6 percent of the visitors was to give the priority for the use of a valley in the park to the bears, (Table 37). It was common to have the visitors say, "I can hike and visit many areas where there are no bears. Let the bears have an area where they are left alone," or, "they were here first, let them have the valley." The data revealed and this study suggests that closing areas to the general public to enhance management for bears would be largely acceptable, especially if the reasons for area or valley closures were explained to the general public.

6.6 Visitor's Attitudes Concerning the Value of Bears

The analysis of the data in this study has attempted to analyze the visitor's attitudes toward and knowledge about bears and assess how these attitudes were affected by selected socio-demographic characteristics. Very few studies to date have attempted to study the visitor-bear relationship from a social-science perspective. Consequently, this study has been exploratory in nature, and the results make at least two valuable contributions. First, is its immediate value in describing the current human perspective in the visitor-bear relationship. Secondly, this study serves to point the direction for future management-oriented research that will yield even further results on the question of how visitors use the information presented and if this information is translated into appropriate behaviour.

Each proposition is discussed in the pages that follow, pointing out how the value of bears, priority for use of a valley, and willingness to take precautions were affected by the variations in the independent (socio-demographic) variables. Table 56 shows the interaction of the independent and dependent variables which were examined.

As can be seen from Table 56, the value of bears was affected by the total biological knowledge about bears. When reviewing Table 38, the chi-square contingency analysis between the value of bears and total knowledge scores; it was noted that the visitors with the low (7-13) total bear knowledge scores had a much higher than expected negativistic value for bears. At the same time the visitors with high (28-35) total knowledge scores had lower than expected negativistic value for bears. These data support the position that by increasing the level of the visitor's total knowledge about the biology of bears will, at a minimum, tend to limit the negativistic value toward bears. Additionally, the visitors that had below average (14-20) total knowledge scores gave higher than expected ecological values. The group with above average (21-27) total knowledge scores had higher than expected naturalistic values and lower than expected ecological values.

In summary, the stated value of bears appears to be related to the level of visitor's knowledge about bears. This is an important relationship and one of which managers should be aware. If one of the management objectives is to maintain bear populations, then clearly providing information, educating, and making the public aware of bears can become a means of developing or securing the and political support for such an objective.

These data do not support the proposition that there are interactions between knowledge and priority use of a valley or taking precautions against an unwanted encounter with bears.

Table 56. Correlation of Significance Between Dependent and Independent Variables

	Independent Variables		
Dependent Variables	Value of Bears	Priority use of Valley	Precautions against Encounters
Knowledge of bears	SD	—	—
Work/Wildlife	—	—	—
Posess Hunting/ Fishing Lic.	—	—	—
Ever Possess Hunting/ Fishing Lic.	—	—	—
Information Source	—	SD	SD
Age	SD	SD	SD
Sex	—	—	—
Education	—	—	SD
City Size	SD	SD	—
User Location	—	SD	SD
User Type	SD	SD	SD

SD means Significant Difference at the $p=0.05$ level

Visitors with higher levels of knowledge about bears did not have an increased tendency for taking precautionary measures against encounters with bears. Specific and factual information concerning precautionary measures must be provided if the management objective was to get the visitor to take precautionary measures.

It was postulated that working with wildlife and engaging in certain consumptive uses like hunting and fishing would affect the visitor's stated attitudes about animals. These data do not support any of the propositions that working with wildlife, currently possessing, or having ever possessed a hunting, fishing, or trapping licence(s), was related to the visitor's value for bears, priority for use of a valley, or taking precautionary measures against unwanted encounters with bears.

The source of the visitor's information about bears was not significantly related to the stated value for bears; however, it was interesting to point out that the visitors who said a hunter training course was their primary source of information expressed a much higher frequency for utilitarian values for bears. Additionally, the hunter training program was correlated with a lower frequency for naturalistic value for bears. In addition, when the source of information was provided by the park staff or "Bear and Man" film there was a tendency for higher than expected frequency for ecological values to be stated and lower than expected utilitarian values expressed by the visitors.

The visitor's source of information about bears was related to how they felt about the priority for the use of a valley in the park, (Table 42). Those visitors who have had encounters with bears and were using the encounters, as the primary source of information about bears, had a much higher than expected frequency to give the priority to visitors and a correspondingly lower frequency for giving valley priority to both bears and visitors. Additionally, it is noted that those having taken a hunter training course exhibited higher than expected frequencies for giving the priority for the use of a valley to visitors.

The source of information was related to the visitor's tendency to make inquiries and take precautions against encounters with bears (Table 47). It was both interesting and significant that T.V., movies, books and magazines as a source of information resulted in higher than expected frequency for not taking precautions against encounters with bears. Clearly the park manager cannot depend upon these information sources to encourage the visitors to believe that making an inquiry or taking precautions concerning bears is important. The pamphlets on the other hand appeared to be more effective in delivering the precautionary message. The visitors who had used the pamphlet as a source of information about bears were taking precautions against encounters with bears at higher rates of frequency than expected. Hunter training courses as a source of information about bears were correlating with not taking precautions against encounters with bears and tended to have similar effects as T.V., movies, books, and magazines.

The park staff and the "Bear and Man" film were very similar to the pamphlets in that they were correlated with a higher frequency for taking precautions against encounters with bears. Clearly the park manager cannot leave the precautionary message or affective information to T.V., movies, books, magazines, and hunter training. Appropriate delivery methods appeared to be either the park-published pamphlets, park staff, or the "Man and Bear" film. The only drawback to these mediums as a source of information on bears was their limited use. Collectively, only 44.8 percent of the visitors gave pamphlets, park staff, or the "Man and Bear" film as their primary sources of information about bears.

The age of the visitor appeared to have a significant effect on the visitor's stated value for bears. As can be seen from Table 39, the 65^{+} year olds visitors had a much higher than expected frequency for utilitarian value for bears. Whether these utilitarian values are a remnant feeling for the past or something that occurs as the visitor ages is not clear. If this utilitarian value is a reflection of a previous pioneering era, it would, therefore, not be projected to be important within the forthcoming generations. In both the 12-24 and 25-64 years-old groups there were fewer than expected utilitarian values expressed by the visitors. This was particularly true for the 12-24 year olds.

Age also affected the priority for the use of a valley in the park. As can be seen in Table 45, the 65^{+} year olds had a higher than expected frequency for giving the priority for the use of a valley to people. There were only 48 percent of the 65^+ year-old age group that gave the priority for the use of a valley to bears. There were, however, 74 percent of the 25-64 year-old age group that gave the priority for the use of a valley to bears. This pattern was even more apparent in the 12-24 year-old age group where 81 percent gave the priority for the use of a valley to the bears. This suggests that the priority for the use of a valley to the bears is projected to increase in the forthcoming generations of park visitors.

The age of the visitor affected the taking of precautions to avoid encounters with bears. As can be seen from Table 48, the 65^+ year- old group had a higher than expected frequency for not taking precautions. This may be accounted for by the fact that these people tended to be in the campgrounds which they may have viewed as relatively safe areas. However, they still may present a significant source of problems, since grandparents are often the role models or sources of information for younger family/friends. Age should be no excuse for not taking precautionary measures; in fact, the greater experience should make them wiser and more informed about bears.

The 65^+ year-old visitors were significantly different from the other age groups in that they expressed utilitarian value for bears, gave priority for the use of a valley to people, and tended not to take precautionary measures. The 25-64 year-old age groups that expressed ecological, aesthetic, and naturalistic values were almost evenly split between taking and not taking precautions against encounters with bears and gave the priority for the use of a valley to bears. The 12-24 year-old age group expressed strong ecological values and were also almost evenly split between taking and not taking precautions against unwanted encounters with bears and gave the strongest support for the priority for the use of a valley to bears.

The sex of the visitor had no significant effect on the stated value of bears, priority for use of a valley in the park, or taking precautions against unwanted encounters with bears.

When considering the effect of education, it can be seen in Table 49 that the visitors with 7-12 years of education had higher than expected frequency for utilitarian value with lower than expected frequency for naturalistic value for bears. At the same time, the college-educated visitor, including graduate training, had a higher than expected frequency for naturalistic value with lower than expected frequency for utilitarian value for bears. Quite clearly, the possession of college-graduate education was related to, and had a bearing on, the visitor's expressed value for bears. This is fairly significant since 55.7 percent of the visitors surveyed had some college-university education. In the future, as a college-university education becomes more common in the general and park visitor population, the shift from utilitarian to naturalistic value for bears might be expected. The visitors with graduate level education expressed an overwhelming support (82.9 percent) for bears having the priority for the use of a valley. The visitors possessing a college education and 7-12 years of education also gave support for bears having the priority for the use of a valley in the park (73.7 percent and 73.8 percent respectively). All three educational groups expressed strong support for bears having the priority for valley use.

The visitors with graduate level educations had a higher than-expected frequency (68.6 percent) for taking precautions and a correspondingly lower than expected frequency (31.4 percent) for not not taking precautions against encounters with bears. There was a weaker but still significant tendency for the visitors with 7-12 years of education to have a higher (56.5 percent) than expected frequency to not take precautions and correspondingly lower (43.5 percent) than expected frequency for taking precaution against any unwanted encounter with bears which is somewhat consistant with the general life experiences at this age level.

The size of the visitor's current home area was correlated with the expressed value of bears. The visitor's current home areas that were from 1-20,000 people had a significantly lower than expected frequency for naturalistic value for bears as can be seen from Table 42. The population size of the visitor's current home area was also correlated to the priority for the use of a valley in the park, as can be seen from Table 44. The visitor's current home areas that are over 100,000+ population had a higher frequency for both people and bear use, and a lower frequency for giving the valley priority to bears. Also, the visitor's current home areas that are from 1-20,000 in population had a lower than expected frequency for giving the valley priority to both bears and people. The visitors from the 100,000+ population areas had a tendency to give the valley priority to the bears but if necessary would compromise for both bears and people receiving equal priority. While the visitor from 1-20,000 and 20,001-100,000 population size areas still gave the priority to bears, there was an overall tendency not to compromise for giving the priority to both bears and people.

In summary, the population size of the visitor's current home area appears related to the value for bear, and the priority for the use of a valley, but apparently was not related with the tendency to take precautions against unwanted encounter with bears. The visitors who indicated, "Yes, they had taken precautions" and who were from the 1-20,000, 20,001-100,000 or 100,001+ population size of the current home areas were 42.2 percent, 44.7 percent, and 49.7 percent respectively.

Bryan and Jansson (1973) reported that the 30.4 percent of the general public who chose not to visit a national park did so because they felt threatened by the animals. It is quite possible that members of the general public have strong feelings about wildlife-related hazards simply do not visit Waterton Lakes National Park. Additionally, the public that utilize the park may recognize the existence of wildlife-related hazards but either accept the hazard or do not feel personally endangered and this may also have affected their attitude towards taking precautions against bear encounters. In any event the demographic characteristics and the visitor's current home area was not correlated to taking precautions regarding unwanted encounters with bears.

The location of the visitor at the time of the interview was not apparently correlated to the value of bears. That is to say that the stated value of bears by the visitors who were utilizing the trails was not significantly different from visitors interviewed at the information bureau, Crandell, and Townsite Campgrounds. As can be seen in Table 45, the trail users had a lower frequency for giving priority to both visitors and bears and a higher frequency for giving the priority to visitors. The visitors at Cameron Lake had a much higher frequency for both bears and visitors, and a lower frequency for visitors receiving the priority.

The information bureau visitors were interesting because of the tendency to give the priority for use of a valley to bears rather than visitors while the townsite visitors wanted a compromise, by giving both bears and visitors equal priority. Whether something significant really happened from the time the visitor left the information centre till they arrived in the townsite is doubtful. This observed difference in the priority for use of a valley may be a reflection of the immediate environment at the time of the interview, or perhaps those visitors more likely to visit an information centre are more enlightened to other matters of the environment.

When considering precautions, as can be seen in Table 50, the visitors in the townsite had a significantly higher frequency for not taking precautions and a lower frequency for taking precautions against unwanted encounters with bears. Clearly the visitors in the townsite either feel safe and see no need for precautions, or camp and stay in the townsite so precautions are not needed. The visitors at the information centre had a significantly higher frequency for taking precautions. This may be the very reason they were at the information centre. In any event, these visitors had the most significant tendency for taking precautions against unwanted encounters with bears. It is noted that the trail users were not significantly different from the other visitor groups when considering precautionary measures. These trail users were the visitors who had spent at least one night in the backcountry and potentially may have had the greatest effect on or contact with the bear populations.

The last variable examined was how the type of user affected the value, valley priority, and precautions. As can be seen in Table 41, the category of park user was strongly related to the visitor's stated value for bears. The hard-sided vehicle users had a lower-than-expected ecological value and higher than expected utilitarian value for bears. The day-users had a higher frequency for ecological values and lower frequency for humanistic values. This indicated that there was a difference between the different user groups and that different messages were necessary if management was attempting to use interpretative programs to change the visitor's value structure regarding bears.

The priority for use of a valley in the park was related to the category of user. As can be seen in Table 46, the day-users had a tendency to give the valley priority to bears rather than people and not to compromise by giving the valley priority to both bears and people. This was significant because if in the future there is a greater park management emphasis on larger day-use patterns, this tendency by the day users to favor people over bears will affect the management of both bears and people. The hard-sided vehicle user also had a tendency to give the priority for use of a valley to people over bears; however, the overall tendency by the visitors was to give the priority for the use of a valley to bears.

There was a significant relationship between taking precautions against unwanted encounters and user type. As can be seen in Table 51, hard-sided vehicle users had a much higher frequency for not taking precautions and lower frequency for taking precautions to avoid unwanted encounters with bears. This may be due to the feeling of security from the hard-sided vehicle. Whether or not this behaviour of not taking precautions against encounters with bears extended into the time the visitor was out of the vehicle hiking/walking/sightseeing is unknown. The exactly opposite attitudes were experienced by the tent users. The visitors using tents had a much lower frequency for not taking precautions against encounters and higher frequency for taking precautions to avoid encounters with bears. Whether or not the precautions taken by the visitors using tents were appropriate was not determined. The data suggest that there was a significant difference between these categories of users.

6.7 Summary of the Visitor's Attitudes About Bears

6.7.1 Value of Bears

As can be seen in Table 58, the stated value of bears corresponded significantly to the visitor's bear knowledge, age, education, current size of home area, and user type. The following is a summary of the findings concerning value of bears.

1. Visitors with limited knowledge of bears tended to display negative values and attitudes

toward bears.

2. As the apparent level of the visitor's knowledge about bears increased, there was a movement away from negative toward more naturalistic values for bears.
3. Older aged visitors, 65+ years old, displayed a higher utilitarian value for bears, as defined by the tendency to see bears as producing some usable commodity, e.g., hide, tallow, or meat.
4. Visitors with 7-12 years of education displayed higher than expected utilitarian values. It was this same group which gave the hunter training course as their major source of information about bears.
5. Visitors with college-university-graduate education displayed higher than expected naturalistic values, as defined by a tendency to see bears as being an important component of the natural environment.
6. Visitors currently living in small population centres had lower than expected naturalistic value for bears.
7. Hard-sided camping vehicle users displayed a lower than expected frequency for ecological values with higher than expected frequency for utilitarian values. These visitors also tended to be within the older age group.
8. Day-users displayed a higher than expected frequency for ecological values and lower than expected frequency for humanistic values.

6.7.2 Priority for the Use of a Valley in the Park

As can be seen in Table 56, the priority for use of a valley in the park corresponded to the visitor's source of information, age, current size of home area, user location, and category of user. The general attitude by 276 visitors (74.6 percent) was to give bears the priority for use of a valley in the park. However, the following is a summary of the exceptions to the general attitude concerning the priority for use of a valley.

1. Visitors who have had encounters with bears have a higher than expected frequency for giving the priority for use of a valley to people and lower priority to bears.

2. Park visitors, 65⁺ years old, had a much higher than expected frequency for giving the priority for use of a valley to people than any other age group.
3. Visitors currently from 100,000⁺ population-sized areas had a higher than expected frequency for indicating the priority for use of a valley should be shared by both people and bears.
4. Trail users did not want both people and bears to receive equal priority for the use of a valley and in general gave the valley priority to bears.
5. Visitors using hard-sided camping vehicles had a higher than expected frequency to give the priority for use of a valley to people rather than bears.

6.7.3 Precautions Taken Against Encounters With Bears

As can be seen in Table 56, the taking of precautions against unwanted encounters with bears was corresponded to the visitor's source of information, age, education, location, and category of user.

1. Visitors that gave pamphlets, park staff, and the "Bear and Man" film as their source(s) of information about bears displayed a higher than expected frequency for taking precautionary measures against encounters with bears. While the visitors that gave T.V., movies, books, and magazines as their primary source(s) of information about bears displayed a lower than expected frequency for taking precautions against encounters with bears.
2. Visitors 65⁺ years old displayed a higher than expected frequency for not taking precautions to avoid unwanted encounters with bears.
3. Visitors with college and graduate level education displayed much higher than expected frequencies for taking precautions to avoid unwanted encounters with bears.
4. Visitors in the townsite displayed a higher than expected frequency for not taking precautions to avoid encounters with bears. The hikers were not significantly different from other categories of users concerning the taking of precautions to avoid unwanted encounters

with bears.

5. Visitors utilizing hard-sided camping vehicles displayed a significantly higher frequency for not taking precautions against encounters with bears. Tent users were indicating a higher than expected frequency for taking precautions, although no attempt was made to determine if these precautionary measures were adequate or appropriate.

6.8 Visitor's Knowledge of Bears by Socio-demographic Characteristics

The data presented have attempted to qualify and quantify the visitor's biological knowledge about black and grizzly bears. Additionally, certain relationships between knowledge and selected socio-demographic variables were tested to show possible correlations and/or cause and effect relationships (Table 57). This was especially true for those visitors that currently possessed or have possessed a hunting and/or fishing licence(s). These visitors didn't possess any higher level of knowledge about bears than any other visitors even though they gave that impression during the interview.

The data clearly show that the visitor's knowledge about both black and grizzly bear was not correlated with or affected by whether or not the visitors worked with wildlife. Even though some visitors indicated they regularly worked with wildlife or animals they did not exhibit an increased level of knowledge about bears.

The ability of the visitors to distinguish between black and grizzly bears was questionable. There was by far too great a tendency to rely on color and size. An almost alarming number, 77 visitors, indicated that the hump was on the back or hind quarter of a grizzly bear.

These data clearly supported the concepts that the knowledge about both black and grizzly bears were strongly related to the visitor's source of information about bears. The visitors who had seen the film "Bears and Man" demonstrated higher levels of knowledge about bears, and the visitors who had talked to park staff demonstrated the second highest level of knowledge on bears; however, these two sources of information were used by less than 10 percent of those interviewed.

Table 57 Analysis of Significance Between Total Bear Knowledge and Independent Variables

Dependent variable	Significant difference p=0.05	Independent variable
Knowledge	—	Work with wildlife/animals
Knowledge	—	Possess Hunting/Fishing Licences
Knowledge	—	Ever Possess Hunting/Fishing Licence
Knowledge	yes	Source of Information
Knowledge	yes	Age of visitor
Knowledge	—	Occupation of visitor
Knowledge	yes	Educational level
Knowledge	—	Current size of home area
Knowledge	—	Location of Interview
Knowledge	yes	User type
Knowledge	—	Sex of visitor

The bear pamphlets distributed by parks were the most common source of information cited by the visitors, but were only moderately effective as a source of information while tour guides, T.V., and movies were just slightly better than no recent source(s) of information about bears. Clearly, the film "Bears and Man" and park staff were the most effective sources of information on bears as measured by the knowledge score index.

The level of knowledge about bears was related to the visitor's age. The 12-17 year olds and 55-64 age group had the highest levels of knowledge about bears. Upon further analysis, many visitors in these age groups gave the "Bear and Man" film and park staff as their sources of information about bears. Once again the park employees or the information-interpretation programs were producing highest levels of knowledge about bears.

The occupation of the visitors were not related to the level of knowledge about bears. This is significant because 3.7 percent of the visitors identified forestry as their current occupation. In fact, 50 percent of this group were park employees on their days off. Yet their apparent level of knowledge about bears was no higher than that of the general population. There appears to be a need for further in-depth training of park employees. The visitors were unable to distinguish between the different categories of park employees.

Those visitors who reported as having graduate level education displayed significantly higher levels of knowledge about bears. Once again, this group largely identified the film, park staff, and the pamphlets as their primary sources of information about bears. Those visitors with higher educational levels were more likely to attend park interpretive programs, to view interpretive exhibits, and to read the brochures.

The population size of the visitor's current home area and the location in the park during the interview were not apparently related to the level of knowledge about bears.

These data clearly point out that the recreational trail users, as a rule, did not possess any higher level of knowledge about bears than the general population. This included their ability to distinguish between black and grizzly bears. Trail users often had no recent source of information about bears and commonly indicated they thought they already knew enough about bears, and so rarely talked to park staff, saw the film, or read the pamphlets. As previously discussed, the hikers indicated that they did take precautions to prevent unwanted encounters but possessed only average knowledge about bears. Because of their average level of bear knowledge it was quite possible the precautions being taken against encounters were incorrect or inadequate. It was indicated that injuries to visitors appeared to be related to the bear's food-seeking behaviour. Storage of food by backcountry users in Yosemite National Park was inadequate: only 3 percent of the backcountry visitors stored their food properly during the summer of 1979 (Yosemite Bear Management, unpublished data, in Hastings, Gilbert and Turner, 1981).

Those visitors using hard-sided camping vehicles displayed a higher level of knowledge than other categories of users. That was interesting because the users that were tent camping demonstrated only moderate levels of knowledge about bears.

The sex of visitors displayed no relationship to levels of knowledge about bears. Although some males gave the impression that it did during the interviews, the data itself doesn't support such a conclusion.

Concerning the relationship between the visitor's level of bear knowledge and value of bears, it was apparent that the knowledge level was apparently related to the value that the visitors had for bears. The visitors with lower levels of bear knowledge scores displayed negative feelings toward bears. Then, as the level of bear knowledge increased, the ecological value became apparent, while at the highest levels of bear knowledge the aesthetic and naturalistic values were dominant. This data suggests that increasing the visitor's level of knowledge about bears may result in attitudes associated with either ecological, aesthetic, or naturalistic values. This suggestion is in agreement with Fortier (1983) where the visitors who were more knowledgeable exhibited attitudes more complementary to bear management objectives than visitors with low knowledge levels. However, it is still unclear whether the increased knowledge actually changed the attitudes or whether the attitudes lead to the desire to know more about bears. It is the investigator's feeling that the increased level of knowledge of bears lead to an attitude change.

Increasing the visitor's general level of knowledge about bears must be more than just an attempt at distributing biological facts. Interpretation-information functions should stress the value of bears, their ecological role, and their relationship with other animals, including man.

This data strongly supports the arguments for greater use of the "Bear and Man" film or similar films, also that the park staff and the pamphlet concerning bears can be effective mediums for the delivery of information. The caution mentioned here is that the park staff need appropriate training. This includes all park staff, because the public could not differentiate between wardens, rangers, naturalists, visitor service, or maintenance staff.

Concerning the pamphlet, the visitors often admitted that even though they cited it as their primary source of information on bears, they in fact had not read it for several years. The reason the visitors often gave for not having read the pamphlet was that it is the same one they received last year(s). Upon further discussion it was discovered that the public were assuming the pamphlet's contents had not changed because the front cover had not changed for several years. Every time there are significant changes in text, the pamphlet's front cover should be changed.

6.9 Summary of the Visitor's Knowledge of Bears

1. The visitors who had worked with wildlife or animals did not display higher levels of knowledge about bears than other visitors.
2. The visitors who currently possessed hunting/fishing licence(s) did not display higher levels of knowledge about bears than other visitors. This included the ability to distinguish between the two species of bears.
3. The visitors who have at sometime in the past possessed hunting/fishing licence(s) did not display higher levels of knowledge about bears than other visitors. This included the ability to distinguish between the two species of bears.
4. There was no significant difference in the level of knowledge of bears according to the occupations of the visitors.

5. Those visitors who worked in forestry, including park-related occupations, did not display higher levels of knowledge about bears. This included the ability to distinguish between the two species of bears.
6. The visitors with some college or university-type education displayed significantly higher levels of knowledge about bears than the other visitors.
7. The population size of the visitor's current home area had no effect on the level of knowledge about bears.
8. The visitors using the trails during the time of the interview displayed no higher levels of bear knowledge than the other visitors.
9. Visitors using hard-sided camping vehicles had the highest level of knowledge of bears.
10. Tenters displayed only average levels of knowledge about bears.
11. The sex of the visitor wasn't related to the level of knowledge about bears.

6.10 Management Implications and Recommendations

This study was undertaken to determine the visitor's attitudes and knowledge about bears and to examine the possible implications of this function to current bear management practices. In order to facilitate an extensive examination of the visitor's attitudes about bears, it was necessary to quantify and qualify with selected socio-demographic characteristics the visitor's knowledge about bears. The socio-demographic characteristics investigated were those that previous researchers had either shown or were suspected to have an effect on attitudes about animals. Very few studies have specifically been focused on the human component of this interaction between bears and man.

The findings of this study were of value in identifying specific information and relationships, indentifying those variables that conceal "dead ends," and identifying other variables that will yield more profitable results when trying to understand the visitor's perceptions of bears and bear management practices.

The visitor's perception of the value of bears were generally positive, but was widely distributed between eight of the ten types of attitudes as described by Kellert (1979). It was quite possible for the visitors to display positive values about bears, while considering them dangerous animals, and not be willing to do anything about preventing encounters with bears. It was interesting to see that virtually no visitor specifically volunteered black bears as being dangerous, while 81.3 percent of the visitors specifically identified either bears or grizzly bears as being dangerous. Even though the visitor viewed black and grizzly bears as being dangerous, it does not mean the visitor wanted the bears killed for management reasons. Park managers should not confuse the public's perception of bears as dangerous animals with willingness to allow an animal to be killed for management reasons.

It should be of concern to park managers that the viewing of bears as dangerous animals seems to be totally independent of taking precautionary measures. Although this phenomenon is of concern, it is not unique in park environments. Campbell *et al.* (1968) noted that during interviews with victims of theft committed in parks, that they were not angry about their losses but philosophized that the crime could have happened to anyone and regarded it as a lesson in tighter security. These park users continued to view the park as a crime-free community and were not at all willing to redefine it. This apparent lack of relationship between the perception of bears as dangerous animals and precautionary action needs further study and analysis.

The positive values for bears did have a positive and direct relationship toward resource uses. A majority of the visitors (74.6 percent) displayed a very positive attitude toward giving the priority for the use of a valley in the park to the bears. Visitors that gave the priority for the use of a valley to people generally displayed negative values toward bears. Perhaps for the first time a positive value or attitude toward bears has been linked to the visitor's stated management preferences. Managers choosing to close a trail or valley due to bears frequenting the area should expect support from a large majority of the visitors while receiving criticisms for such a trail closure from visitors over 65 years old, those who have had encounters with bears in the past, trail users, and visitors in hard-sided camping vehicles.

It was shown that the visitor's negative attitudes about bears were coupled with the poor levels of knowledge about bears. In the present study, low levels of knowledge of bears was correlated with negativistic values for bears while higher levels of knowledge of bears were characterized by the lack of negativistic values for bears. In this regard, raising the level of knowledge about bears should help to reduce the visitor's negative values for bears. Mihalic (1974) found that level of knowledge about bears seemed to have no effect on attitude in and of itself. Mihalic's use of the term "attitude" included several issues, one of which was the value issue. It is quite possible that both studies are correct that, in general, knowledge about bears has little overall effect on attitudes, while knowledge about bears may be related to the specific value the visitor had for bears. The level of the visitor's knowledge about bears seemed to be operating independently from their behaviour of taking precautions against unwanted encounters with bears. This whole behaviour of why visitors either take or fail to take precautionary measures was not well understood. There was no attempt to determine if the precautionary measures which were being taken were appropriate or correct. Of the 45 percent of the visitors that said they had taken some form of precautionary measures, it was quite possible that there may be many serious misconceptions. A further study of the precautionary measures being taken would be of great value to managers in identifying current problems. Additionally, if such a study were to examine the motivations as to why precautions were either taken or not, it would identify new management strategies. It appears to be critical that more visitors be encouraged to take precautions to avoid encounters, especially the trail and tent users.

It is clear that some of the public were relying on park staff for information on bears. However, the forestry occupation, which included several park staff, did not have above average levels of knowledge about bears. These park staff members included national, provincial, and state park employees. In general, the public was unable to distinguish between park staff, e.g., wardens, rangers, naturalists, interpreters, visitor service, or maintenance staff.

This study supports the value that park interpretation programs can perform. In the future these interpretive programs should be focused on additional themes of value of bears, ecological roles of bears, and social interactions between bears and other animals, including man. These programs could further address the issue of taking precautions and appropriate precautions. It is important that the trail users be exposed to these interpretive messages concerning precautionary measures. This can be accomplished through improved trail entrance stations or permit systems. The backcountry visitors gave a general feeling of having sufficient knowledge about bears and, therefore, saw no need to take precautionary measures to avoid encounters with bears.

These interpretive or management measures are needed in order to educate the visitor and to counter the negative or innocent image given bears by the more popular media forms. The visitor's behaviour of not realizing the black bear is a dangerous animal does not speak well about the future of bear management. If visitors continue to view black bears as not being a dangerous animal, it may affect a whole range of human attitudes, values, and behaviour toward bears and other potentially dangerous animals.

In terms of future research, there is a need to better understand the variables associated with precautionary measures. In addition, the precautionary measures that are currently being practiced by the visitors need close examination.

7. REFERENCES

Abelson, R. 1972. Are attitudes necessary? *In* Attitudes, Conflicts, and Social Change. Academic Press. New York, New York. 265 pp.

Allport, G. 1967. Attitudes: Readings in attitude theory and measurement. *ed.* by Martin Fishbein. John Wiley and Sons, Inc. New York, New York. 186 pp.

Alvord, D.J. 1972. Achievments and attitudes. Science Teacher 39(4): 36-38.

Bacon, E.S. 1974. Use of a survey on park visitor attitudes and knowledge to help formulate educational programs. *In* Proceedings of the 2nd Eastern Blackbear Workshop: Black Bear Management and Research, eds. M.R. Pelton and R.H. Conley. pp. 207-213.

Barnard, C. 1938. The functions of the executive. Harvard Press. Cambridge, Massachusetts. 211 pp.

Bell, J. 1973. Visitor management: Maintaining effective visitor controls. Unpublished Paper presented at Fdeeral and Provincial Parks Conference, September 1973.

Bem, D. 1970. Belief attitudes and human affairs. Brooks/Cole Publ. Co. Belmont, California. 183 pp.

Bowman, M. 1975. Assessing college students' attitudes toward environmental issues. J. Env. Ed. 6(2):1-4.

Bryan, H. 1980. Sociological and psychological approaches for assessing and categorizing widllife values. *In* Wildlife Values, eds. W.W. Shaw and E.H. Zube. Centre for Assessing Noncommodity Natural Resource Values, Institute Ser. Rep. No. 1. pp. 70-76.

Bryan, R.B., and M.C. Jansson. 1973. Perception of wildlife hazard in national park use. Trans. of North Am. Wild. Nat. Res. Conf. 38: 129-143.

Burghardt, G.M., R.O. Hietala, and M.R. Pelton. 1972. Knowledge and attitudes concerning black bears by users of the Great Smoky Mountains National Park. Int. Conf. Bears Res. Mgt. 2: 255-273.

Burrus-Bammel, L. 1978. Information's effect on attitude: A longitudinal study. J. Env. Ed. 9(4): 41-50.

Butler, J.R. 1980. The role of interpretation as a motivating agent toward park resource protection. Ph.D. Diss. Univ. of Washington. 245 pp.

Campbell F., J.C. Hendee, and R. Clark. 1968. Law and order in public parks. U.S.D.A., For. Serv., Pacific Northwest For. and Range Exp. Stn., Seattle, Washington. 6 pp.

Caras, R.A. 1969. In Defense of the grizzly. Audubon. 71(5): 52-55.

Cella, W.B., and J.A. Keay. 1980. Annual bear management and incident report, Yosemite National Park. 1978. U.S.D.I., Nat. Park Serv. Rep., Washington, D.C.

Chayer, N. 1970. An act respecting national parks. *In* Revised statutes of Canada 1970, Volume V, Queen's Printer. Ottawa, Ontario. p. 5414.

Cooper, T., and W.W. Shaw. 1979. Wildlands management for wildlife viewing. *In* Proceedings of Our national landscape: a conference on applied techniques and analysis and management of the visual resource, eds. G.H. Elsner and R.C. Smardon, U.S.D.A., Gen. Tec. Rep. P.S.W.-35, Incline Village, Nevada. pp. 700-705.

Craighead, F.C., and J.J. Craighead. 1972. Data on grizzly bears, denning activities and behaviour. Obtained by using wildlife telemetry. *In* Bears - Their biology and management. Ed. S. Herrero. IUCN publ. New Ser. 23. Morges, Switzerland. pp. 84-106.

Craighead, F.C. 1979. The track of the grizzly. San Francisco, California: Sierra Club Books. 261 pp.

Cramond, M. 1981. Killer bears. New York: Times Mirror Magazine, Inc., New York. 315 pp.

Dahlgren, R.B., A. Wyialowski, T.A. Bubolz, and V.L. Wright. 1977. Influences of knowledge of wildlife management principles on behaviour and attitudes toward resource issues. Trans. North Am. Wild. Nat. Res. Conf. 42: 146-155.

Dean, F.C. 1968. Brown bear-human interrelationships study, final report. Unpubl. Rep. to the U.S.D.I., Nat. Park Serv., Fairbanks, Alaska. 81 pp.

Deese, J. 1967. General psychology. Allyn and Bacon Inc. Boston, Massachusetts. 557 pp.

Dushane, J. 1974. In-service programs for teachers in northwest Ohio. J. Env. Ed. 5(3): 12-14.

East, B. 1977. Bears. Crowen Publ. Inc. New York, New York. 275 pp.

Egbert, A.L., and A.W. Stokes. 1976. The social behaviour of brown bears on an Alaskan salmon stream. *In* Bears - their biology and management, eds. M.R. Pelton, J.W. Lentfer, and G.E. Folk, Jr. IUCN Publ. New Ser. 40. Morges, Switzerland. pp. 41-56.

Field, D.R., and J.A. Wagar. 1973. Visitor groups and interpretation in parks and other outdoor leisure settings. J. Env. Ed. 5(1): 31-36.

Filon, F.L., S.W. James, J.-L. Ducharme, W. Pepper, R. Reid, P. Boxall, and D. Teillet. 1983. The importance of wildlife to Canadians. Env. Canada, Can. Wild. Serv., Ottawa, Ontario. 40 pp.

Fishbein, M., and I. Ajzen. 1975. Belief, attitude, intention, and behaviour: an introduction to theory and research. Addison-Wesley. Reading, Massachusetts. pp. 578.

Fortier, B.C. 1983. Bear management at Yellowstone National Park: effectiveness of information dissemination to visitors. Master's thesis. Colorado State Univ.

Hall, E.R., and K.R. Kelson. 1981. The mammals of North America. Ronald Press Company. New York, New York. pp. 1358.

Hastings, B.C. 1983. Black bear aggressions in the backcountry of Yosemite National Park. *In* Proc. of the 6th Int. Conf. on Bear Res. & Mgt., Grand Canyon Nat. Park, Arizona. pp. 8-23.

Hastings, B.C. 1986. Wildlife-related perceptions of visitors in Cades Cove, Great Smoky Mt. Nat. Park. Ph.D. diss. Univ. of Tennessee. 259 pp.

Hastings, B.C., and B.K. Gilbert. 1981. Adverse conditioning of black bears in the backcountry of Yosemite National Park. *In* Proc. of the Second Conf. on Sci. Res. in Nat. Parks. 7: 294-303.

Hastings, B.C., B.K. Gilbert, and D.L. Turner. 1981. Black bear behaviour and human-bear relationships in Yosemite National Park. Nat. Park Final Rep. to Nat. Park Serv., Univ. of California. Davis Coop. Res. Studies Unit Tech. Rep. No. 2. 42 pp.

Hastings, B.C., and W.E. Hammitt. 1986. Visitor knowledge about wildlife and wildlife management in Great Smoky Mountains National Park. *In* Proc. of the First Nat. Symp. of the Soc. Sci. in Res. Mgt. Corvallis, Oregon. pp. 18.

Haynes, B.D., and E. Haynes. 1979. The grizzly bear: Portraits from life. Norman, Oklahoma: Univ. of Oklahoma Press. 370 pp.

Heberlein, T.A. 1973. Social psychological assumptions of user attitude surveys: The case of the wildernism scale. J. of Leis. Res. 5(3): 18-33.

Hendee, J.C. 1972. Challenging the folklore of environmental education. J. of Env. Ed. 3(3): 12-23.

Hendee, J.C., and C. Schoenfeld, eds. 1973. Human dimensions in wildlife programs. Washington, D.C.: Wild. Mgt. Inst.

Henning, D.H. 1970. Comments on interdisciplinary social science approach for conservation administration. Bioscience 29(1): 11-16.

Hepburn, M.A. 1974. Providing an analytical framework for environmental social studies. J. Env. Ed. 5(4): 25-28.

Hepburn, M.A., and E. Keach. 1974. The impact of environmentalism on the social studies curriculum. J. Env. Ed. 5(3): 15-18.

Herrero, S. 1970. Human injury inflicted by grizzly bears. Science 170: 593-598.

Herrero, S. 1976. Conflicts between man and grizzly bears in the national parks of North America. *In* Bears — Their biology and management, eds. M.R. Melton, J.W. Lentfer, and G.E. Folk, IUCN Publ. New Ser. 40. Morges, Switzerland. pp. 121-145.

Herrero, S. 1978. A comparison of some features of the evolution, ecology and behaviour of black and grizzly/brown bears. Carnivore 1(1): 7-17.

Herrero, S. 1985. Bear attacks: Their causes and avoidance. Winchester Press. Piscataway, New Jersey. 287 pp.

Hornocker, M.G. 1962. Population characteristics and social and reproductive behaviour of the grizzly bear in Yellowstone National Park. Master's thesis. Montana State Univ. 94 pp.

Iverson, R. 1975. An analysis of the interrelationships of environmental knowledge and environmental concern. Ph.D. diss. Univ. of Montana.

Jack, I., and S. Zazelenchuck. 1970. A survey of visitors response to interpretive evening program. Dept. of Environment, Parks Canada, Kootenay National Park, Ottawa, Ontario. 23 pp.

Jonkel, C.J. 1970. Some comments on polar bear management. Biol. Conserv. 2: 115–119.

Kellert, S.R. 1979. Public attitudes toward critical wildlife and natural habitat issues, Phase I. Report to U.S.D.I., Fish and Wild. Serv., Washington, D.C. 138 pp.

Kellert, S.R. 1980*a*. Activities of the American public relating to animals Phase II. Rep. to U.S.D.I., Fish and Wild. Serv., Washington, D.C. 178 pp.

Kellert, S.R. 1980b. Contemporary values of wildlife in North American society. *In* Wildlife values, eds. W.W. Shaw and E.H. Zube. Centre for Assessing Noncommodity Natural Resource Values, Institute Ser. Rep. No. 1. pp. 31-60.

Kellert, S.R. 1983. Affective, cognitive, and evaluative perceptions of animals. *In* Behaviour and the natural environment, eds. I. Altman and J.F. Wolhwill, Plenum Press. New York, New York. pp. 241-267.

Kellert, S.R. 1985. Birdwatching in American society. Leis. Sci. 7(3): 343-360.

Kellner, R., and R. Waupinski. 1974. All about project 1-C-E. J. Env. Ed. 5(3): 27-28.

Kemp, G.A. 1976. The dynamics and regulation of black bear (*Ursus americanus*) populations in northern Alberta. *In* Bears — Their biology and management, eds. M.R. Pelton, J.W. Lentfer, and G.E. Folk. IUCN Publ. New Ser. 40. Morges, Switzerland. pp. 191-197.

Kliejnas, P.T. 1969. Attitudes toward object and attitudes toward situation as predictors of behaviours. Unpubl. Master's thesis, Michigan State Univ.

Kittridge, W. 1982. Grizzly: Too close. Outside 6(7): 35-41, 85.

Knudson, D.M. 1978. Conference summary: The interactions of wildlife and people. *In* Wildlife and people: The John S. Wright Forestry Conference, ed. by C.M. Kirkpatrick. Purdue Research Foundation. Lafayette, Indiana. pp. 188-191.

LaHart, D.E. 1978. The influence of knowledge on young people's perceptions about wildlife. Final Report to Nat. Wild. Fed., Florida State Univ. Tallahassee, Florida. 114 pp.

LaHart, D.E., and L.W. Barnes. 1978. The influence of knowledge and animal-related activities on consumptive and nonconsumptive resource orientation. Proc. of the Ann. Conf. Southeast Assoc. Fish and Wild. Agencies. 32: 783-789.

Leukel, F. 1976. Introduction to physiological psychology. C.V. Mosby Co. St. Louis, Missouri. 514 pp.

Lucas, R.C., and G.H. Stankey. 1974. Social carrying capacity for backcountry recreation. *In* Outdoor Recreation Research: Applying the Results. U.S.D.A., For. Serv. Gen. Tech. Rep. NC-9. pp. 14-23.

Martinka, C.J. 1972. Habitat relationships of grizzly bears in Glacier National Park, Montana. J. Mem. 55: 21-29.

Martinka, C.J. 1974. Preserving the natural status of grizzly bears in Glacier National Park. Wild. Soc. Bull. 2: 13-17.

Martinka, C.J. 1976. Ecological role and management of grizzly bears in Glacier National Park, Montana. *In* Bears — Their biology and management, eds. M.R. Pelton, J.W. Lentfer, and G.E. Folk, Jr. IUCN Publ. New Ser. 40. Morges, Switzerland. pp. 147-156.

McArthur-Jope, K.L. 1983. Habituation of grizzly bears to people: A hypothesis, ed. by C.E. Meslow. Fifth Int. Conf. on Bear Res. and Mgt., Madison, Wisconsin. pp. 322-327.

Mihalic, D.A. 1974. Visitor attitudes toward grizzly bears in Glacier National Park, Montana. Master's thesis, Michigan State Univ. 125 pp.

Milbrath, L.W., and R.C. Sahr. 1975. Perceptions of environmental quality. Soc. Ind. Res. 1: 397-438.

Moore, D.E. 1983. The effects of guided experiences with animals on the beliefs, attitudes, behavioural intentions and knowledge of children. Ph.D. diss. Univ. of Wyoming. 198 pp.

Moore, T.A. 1977. The formation of wildlife perceptions. Transactions Northeast Fish Wild. Conf. pp. 81-85.

Nagy, J.A., and R.H. Russell. 1978. Ecological studies of the boreal grizzly bear (*Ursus arctos* L.). Environment Canada, Can. Wild. Serv., Edmonton, Alberta. 72 pp.

Parks Canada. 1980. Parks Canada Policy. Ottawa: Ministry of Supplies and Services, Canada. 65 pp.

Parks Canada. 1981. Bear management plan Waterton Lakes National Park. Western Region, Waterton Lakes National Park, Alberta. 76 pp.

Parks Canada. 1983. Western region directories. Western Region, Calgary, Alberta. 5 pp.

Parks Canada. 1984. You are in bear country. Dept. of Environment, Hull, Quebec. 6 pp.

Parks Canada. 1985. Interactions between bears and humans. *In* A background paper for the four mountain parks planning program. Western Region, Calgary, Alberta. 19 pp.

Pettus, A. 1976. Environmental education and environmental attitudes. J. Env. Ed. 8(1): 48-51.

Pirt, G. 1976. Attitudes toward wildlife: Development and testing of measurement scales. Northern Nat. Res. Mgmt. Pract. Nat. Res. Inst. pp. 98.

Poelker, R.J., and J.D. Hartwell. 1973. Black bear of Washington. Bio. Bull. 14. Washington State Game Dept. Olympia, Washington. 180 pp.

Pomerantz, G.E. 1977. Young people's attitudes towards wildlife. Michigan Dept. Nat. Res., Wild. Div., Rep. No. 2781., Lansing, Michigan. 79 pp.

Ramsey C.E., and R.E. Rickson. 1976. Environmental knowledge and att[illegible]des. J. Env. Ed. 8: 10-18.

Rogers, L.L. 1977. Social relationships, movements, and population dynamics of black bears in northeastern Minnesota. Ph.D. diss. Univ. of Minnesota. 203 pp.

Rokeach, M. 1970. Beliefs, attitudes and values. Jossey-Bass Inc. San Francisco, California.

Roth, C., and R. Hodgson. 1977. The Contribution of perception training to interpretation effectiveness: An experiment. J. Env. Ed. 9(1).

Rubin, D. 1974. Environmental information: A review and appraisal. J. Env. Ed. 6(1): 61-63.

Schneider, B. 1977. Where the grizzly walks. Mountain Press Publ. Co. Missoula, Montana. 191 pp.

Seton, E.T. 1909. Lives of game animals. Vol 2. Doubleday, Doran and Co., Inc. New York, New York.

Sharpe, G.W. 1976. Interpreting the environment. John Wiley and Sons, Inc. New York, New York. 694 pp.

Shaw, W.W., and E.H. Zube. 1980. Wildlife values: a workshop on assessment methodologies and information needs. pp. 4-10. *In* Wildlife values, eds. W.W. Shaw and E.H. Zube. Centre for Assessing Noncommodity Natural Resources Values, Inst. Ser. Rep. No. 1.

Singer, F.J. 1978. Seasonal concentrations of grizzly bears, North Fork of the Flathead River, Montana. Can. Field Nat. 92: 283-286.

Spry, I.M. 1963. The Palliser expedition. MacMillan Co. Toronto, Ontario. pp. 310.

Stokes, A.W. 1970. An ecologist's views on managing grizzly bears. Bio Science 10: 1154-1157.

Stonorov, D. 1972. Protocol at the annual brown bear harvest. Nat. Hist. 81(9): 66-73.

Storer, T.I., and L.P. Trevis, Jr. 1978. California grizzly. Univ. of California. California. pp. 335.

Sundstrom, T.C. 1984. An analysis of Denali National Park and Reserves management program to educate visitors regarding behaviour while in bear country. Master's thesis. Univ. of Wyoming. pp. 291.

Swan, J.A. 1977. The psychological significance of the wilderness experience. J. Env. Ed. 8(4): 6-7.

Thorsell, J.W., 1967. Waterton Lakes National Park visitor use survey 1966. Nat. Park Serv., Dept. Indian Affairs and North. Dev., Rec. Res. Rep. No. 24, Calgary, Alberta. pp.

Troyer, W.A., and R.J. Hemsel. 1964. Structure and distribution of Kodiak bear populations. J. Wild. Mgmt. 28: 769-772.

U.S.D.I. 1984. Bear Management Plan Glacier National Park. National Park Service, Glacier National Park, West Glacier, Mt. 49 pp.

U.S.D.I. 1986. Bear Management Plan Glacier National Park. National Park Service, Glacier National Park. West Glacier, Mt. 53 pp.

Wicker, A.W. 1969. Attitudes versus actions: The relationship of verbal and overt behavioural responses to attitude objects. J. Soc. Issues. 25(4): 41-78.

Witter, D.J. 1980. Wildlife values applications and information needs in state wildlife management agencies. *In* Wildlife Values, eds. W.W. Shaw and E.H. Zube. Centre for Assessing Noncommodity Natural Resource Values, Institute Ser. Rep. No. 1. pp. 83-90.

Zanden, J.W.V. 1984. Social psychology. 3rd Edition. Random House. New York, New York. pp. 567.